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PRINTING

A PRACTICAL TREATISE ON THE ART OF TYPOGRAPHY AS APPLIED MORE PARTICULARLY TO THE PRINTING OF BOOKS

BY

CHARLES THOMAS JACOBI

MANAGING PARTNER OF THE CHISWICK PRESS
EXAMINER IN TYPOGRAPHY TO THE CITY AND
GUILDS OF LONDON INSTITUTE, 1892-7

FIFTH EDITION
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NOTE TO THE FIFTH EDITION

IT is only necessary to state that this new edition has again been verbally corrected in various places and that certain sections, particularly those relating to Composing Machines, Motive Power, and to Printing Machinery, have been revised and brought up to date. It also includes the various Examination Papers which were set for the years 1907 to 1912.

The author begs to express his best thanks for the loan of many blocks and for much information readily afforded by many friends, too numerous to specify, but whose names will be obvious by reference to the text and to some of the illustrations contained in this work.

C. T. J.

December 1912.

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INTRODUCTION

SINCE this work was first issued, book-printing as an art has greatly improved. This improvement has been attributed to various causes, and one suggestion in reference to its decorative side is that the work of William Morris at the Kelmscott Press has had a stimulating effect on the general printer. That this is so cannot be doubted, for one can see that artist's influence in many of the best books printed during the past decade. This is to be observed not only in this country, but in America, and on the Continent, too. Besides the example of the Kelmscott Press, the general printer has many advantages which did not exist in former years. For instance, the selection of book-types now offered is much greater, many of the founts being of good design, but it still requires discrimination in selecting the best kinds.

From a more utilitarian standpoint, the enormous increase of process work has demanded improvements in a practical direction, and that this demand has been met need not be said when one observes the large amount of graphic literature emanating from the printing press of the present day. We have now printing machines capable of turning out all kinds of work in the best possible manner, provided that the workman has the necessary skill. Again, work is now executed under very different conditions from what was formerly the case, for many printing offices are model factories as compared with the old order of things, the natural laws of light, sanitation, and ventilation having been studied for the benefit both of the worker and of his work.

Having all these advantages, the printer should be able

to produce better work than his predecessors, but it must be borne in mind that good book-printing requires something more than the actual means of production. It is essential that the printer should have a taste for good books, and should be able to differentiate between a carefully designed volume and one that is ill-shapen. This appreciation comes easily to some, but in others it is certainly not instinctive, although it may to some extent be cultivated and acquired by the study of well printed volumes.

The first step to be taken is the selection of a suitable type, the second is the precise *format* of the page when the size of the volume is given. These are two of the most important factors of book production, and even good press work will not redeem a badly chosen type or a disproportioned page. These two things having been attained, the choice of paper and the precise margin are the next stages in the production of a comely volume. Lastly, the actual printing—a good, firm, clean, and sharp impression with a really good black ink—one which will not fade or turn brown—should complete the evolution of a well printed book.

Without the necessary planning out of the type and page, together with an appropriate paper, the after labour is in vain, therefore it is incumbent that these first essentials be carefully studied.

The aim should be to secure a good effect from the two open pages of a book—one page is not sufficient: two are essential to secure some sort of balance. In considering the dual effect, legibility must be striven for, and not sacrificed, in obtaining the general result.

Taste in printing varies, as in other art subjects, and it is impossible to lay down any stringent rules or to define the canons which should regulate it. If, however, the foregoing suggestions are carefully acted on the student will not go far wrong. The best volumes produced have generally been the results of much thought and experiment.

The writer of this volume can lay claim to have had some experience on examining bodies, and he has in that connection frequently met with very poor work in the papers which have passed through his hands during recent years, and a few words on that subject will not be out of place in this introduction.

That technical classes are a necessity nowadays will be admitted all round; for, owing to the growing custom of subdividing the departments, especially in large printing offices, the workman does not obtain that general experience which he did formerly. Machinery then was not brought to such perfection as at the present time, and competition did not warrant the making of specialists, as it were, in the different sections or departments of a printing office.

By some it is expected that technical education is going to remedy this state of things, but this is a mistake, for these classes cannot possibly compete with the workshop: they exist simply for the purpose of supplementing the knowledge gained in the office during the working day, and that practised or studied in the evening class must naturally be more of the theoretical than of the practical order, although some classes have been provided with fairly good equipment for the teaching of the students.

Under these circumstances the learner must help himself in acquiring that knowledge which will be useful to him if he aspires to be something more than a mere workman of the rule-of-thumb class. He must, in addition to his daily work and evening class, study for himself by reading all the trade and technical literature he can obtain, and for that purpose there are libraries where he can procure that supplementary knowledge.

No student should attempt to sit for an examination till he feels sure that he can do justice to himself, and this applies more particularly to the honours grade and to competitive examinations. It is to his own interest that he should

postpone to a later period that ordeal, for a bad pass is very disheartening and is apt to deter him from further efforts in that direction. Let him be patient and abide his opportunity, for, as a rule, some proportion of the candidates who go up for examination are hopelessly unprepared. It is far better to wait even a year, and if the student is persevering he will find that he has acquired a deal of additional information and knowledge in that period which will better fit him for the test.

Let him have in the interval ears and eyes for everything in connection with types, machinery, paper, and illustrations of all kinds, and at the same time endeavour to find out the why and wherefore of everything that comes within his ken. He should make himself perfectly familiar with the materials handled not only in his particular department, but should in addition acquire some intelligent appreciation of those used in the other branches with which he may be in touch. A thorough grasp of the component parts or constituent properties of all materials is absolutely necessary if he wishes to increase his general knowledge. When this has been obtained he will be able to practise, or at least observe in others their application in the execution of good work.

It should be borne in mind that a competent workman can often obtain better results with indifferent materials than an incompetent one with the best. It is an old saying that a bad workman quarrels with his tools, and that this is frequently the case is the experience of those responsible for the efficient working of any printing establishment.

In recent years the facilities for teaching have much improved through the grants made by the London County Council for the further maintenance and equipment of the various classes in London. This also applies to some other county authorities where printing is one of the subjects taught.

PRINTING

TYPEFOUNDING AND TYPE BODIES

CHAPTER I

Letterpress Printing defined—The Production of Type: the Punch, Matrix, and Moulds for Hand and Machine Casting—The Rotary Type-casting Machine—Component parts of Metal—Selection of Founts of Type for Wearing Properties and Good Appearance—List of Letters which constitute a Fount—Fractions, Accents, and Signs—Varieties of Old Face, Old Style, and Modern Faces—Italic—Black-letter Founts—Some Jobbing Founts—Distinctive Parts of a Letter—Classification of Letters—The Bodies of Types in Depth—Sizes of Types—Relation of Types to each other in Body—Spaces and Quadrats—Measurements of Type Bodies shown at a glance—The Point System with Standard Line and Unit Set Types.

LETTERPRESS printing, or typography, is the art of printing from movable types, the surface of these types being inked and then impressed on to the paper. Another term would be relief printing, in contradistinction to plate or intaglio printing; this latter process, of which this book will not attempt to treat, being obtained by entirely opposite means. For instance, a sheet of copper is taken, and the parts to be printed are cut out, whether separate letters or designs; then, when the plate is finished, it is inked over, the ink being deposited in the hollows or furrows. The surface is then cleaned of superfluous ink. This act is usually performed by a skilful movement of the palm of the hand, care being exercised not to wipe out the ink from the interstices. The paper is then impressed into the hollows

formed in the plate. Thus, whilst relief printing is a method of indentation—the ink being really forced into the paper—the intaglio process leaves the ink somewhat raised on the surface of the finished copy. The following diagram will explain this:

Relief .... *paper surface.*
Intaglio .... *paper surface.*

Subsequent pressing or rolling, if necessary, removes the indentation or impression from sheets printed by the letterpress method, besides improving the surface. Work executed by the copperplate process is never pressed, as the printing would be "smashed" and thus spoilt.

Letterpress printing embraces type, woodcuts, process-blocks, electrotype and stereotype plates—in fact, everything obtained by the relief method.

Practically speaking, the same system is still largely used in the setting of type for bookwork as when William Caxton brought to this country the art of printing, and it is only in matters of detail, as concerns the casting and finishing of type, that it has improved. Ever since 1477, when Caxton issued his first book, "Dictes and Sayings of the Philosophers," from Westminster, types have been picked up singly, notwithstanding various attempts to perfect the mechanical appliances invented from time to time for type-setting.

In the olden time printers made their own types, and it was not till the seventeenth century that the arts of letter-founding and printing began to be divided. Moxon, in his "Mechanical Exercises," vol. ii, 1683, is the first practical and the most reliable authority on the subject of the making of types; it is curious to see how the same methods and appliances were in use till quite a recent date in the production of types by hand. It was not until the middle of the nineteenth century that machinery was generally applied to type-casting. This of course was the means of enormously

increasing the output, and consequently reducing cost very considerably. The old plan of hand-casting is rarely used, and then only for the production of small orders for "sorts."

The manufacture of types and a description of the parts of a single letter may appropriately be treated of before we

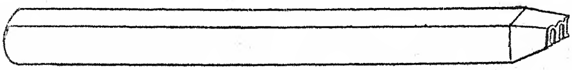


FIG. 1. PUNCH.

commence with the initial stage of printing, *i.e.*, composition of type. To start with, the punch-cutter is provided with a long square piece of steel, on the end of which he proceeds to cut the required letter. A proof is obtained by the aid of smoke as the finishing of the letter advances. By this proof he can see more readily any defects in the shape. When satisfactorily executed it is hardened. This *punch* is somewhat of the shape and size shown here, fig. 1. It is then struck into an oblong bar of copper, thus forming a *matrix* or "*strike*," fig. 2. These matrices can be replaced when worn out, but it is highly important that the utmost care should be taken of the originals. After the matrix is struck, it requires very careful justifying to insure perfect depth and ranging of face, for nothing is so bad as an irregular type in regard to thick and thin lines or an up and down tendency in ranging of line.

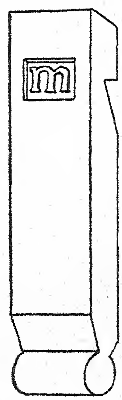


FIG. 2. MATRIX.

It should be interesting to the student to note that the old method of casting by hand was performed by means of a *mould* of two equal portions, figs. 3 (opened) and 4 (closed), closed and fastened by means of a spring loop; this mould

was made of wood and lined with iron. Each size of body required a different mould, but the precise width could be regulated according to the thickness of letter to be cast.

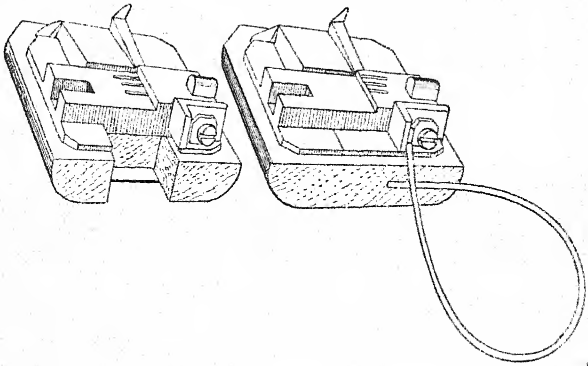


FIG. 3. HAND-MOULD (OPENED).

This operation of casting, though apparently a simple one, required experience and judgement, so that the mould might

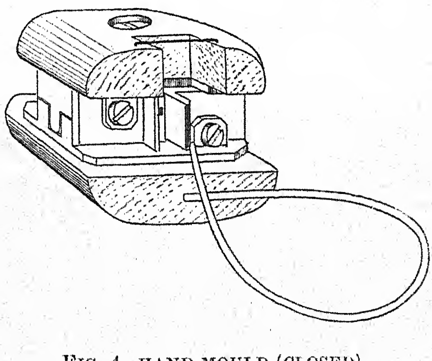


FIG. 4. HAND-MOULD (CLOSED).

be well filled, and the letter perfect in body and face when finished. To perform this, the mould is filled with the metal

heated up to a given degree, and with a peculiar jerk of the left hand, which held the mould, the metal was sent right home into the very inmost portions of the matrix, thus giving a perfect cast of the letter. The metal cooling very quickly, the mould was opened, and the letter turned out, with a tag of metal at the foot technically called a "*break*," fig. 5. This action was repeated until the required number of letters was made, the matrices being changed as often as a fresh letter was needed. The superfluous metal was then broken off, and the letter rubbed, dressed, and grooved at the foot, after being set up in long lines; most of these latter details being executed by boys.

FIG. 5. TYPE WITH TAG.

The production of type requires the work of many different persons, but the most important part is that which is performed at the outset—the punch-cutting.

The mechanical appliances for type-casting have been improved from year to year. These machines are propelled by means of either hand or power. The same matrices can be used, and a mould adapted for the machine is the only difference. The letters are delivered in a constant stream as cast. Machine type can usually be identified by the round *pin-mark*, fig. 6, on the top side of the letter. Some machines profess to turn the type out already dressed, but we do not recommend them for absolute finish, especially if the type is to be used for really first-class book-printing.

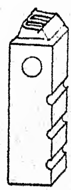


FIG. 6. FINISHED TYPE.

In the *type-casting machine*, fig. 7, the furnace is situated at the foot, and the metal is kept fluid in the pot situated above. Suspended over this pot is a piston or what may be termed a plunger. Each revolution of the crank gives this

plunger a sudden thrust, which injects through an aperture sufficient of the molten metal to fill the mould and the

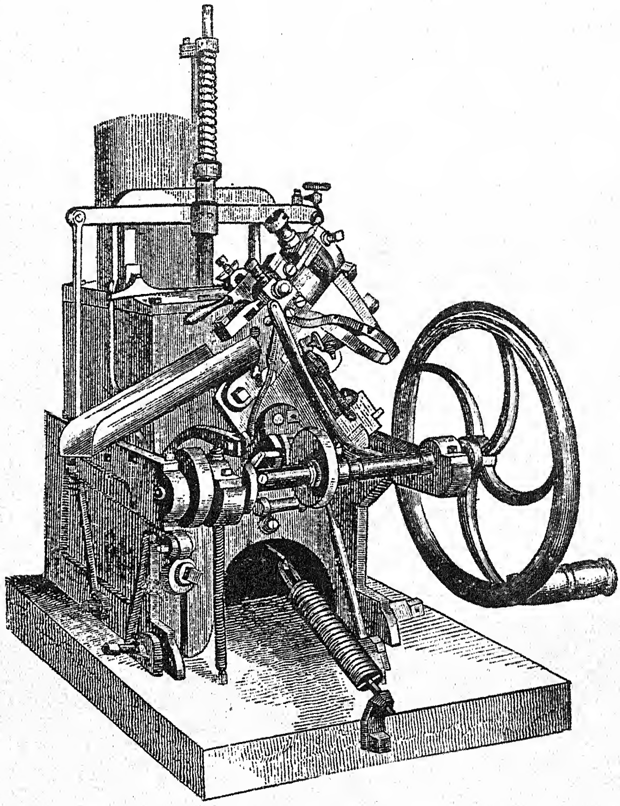


FIG. 7. TYPE-CASTING MACHINE.

matrix, this matrix being held in position by a lever. Directly the mould receives the metal, it opens at a somewhat low angle, similar to a door hung on hinges. At the

same moment the pressure on the lever, binding the matrix close to the mould, is released, and then the matrix springs backward. The type is held in the upper half of the mould by a pin, and when it rises by the aid of a rod connected with the apron, the stool hits the face end at the back, and dislodges the type. As the type is released the mould closes of its own accord, and the plunger squirts a fresh supply of the metal which is then thrown out exactly as before, a cast printing type.

The *Rotary Type-casting Machine* which was invented by the late Frederick Wicks has been acquired by the Blackfriars Type Foundry, Ltd., where several machines are in daily use. To give an idea of its great capacity the following description is necessary.

The machine itself, fig. 8, is mounted on a substantial bedplate. Secured to this is a cast-iron fire-box which carries a metal pot in which the pump is fitted. The pump body is immersed in type-metal, which is kept in a molten state by gas burners beneath the metal pot. The pump is also driven by a belt from the same underground shafting which drives the casting machines. The pot is of a somewhat larger size than is customary with type-casting machines, and holds 5 cwt. of metal. These metal pots are fitted with pyrometers for maintaining a regular temperature.

The pump consists of a body in which four plungers work, driven by eccentrics; the molten metal is sucked in through inlet valves and delivered into a pipe fitted with a device for regulating the fluid pressure at the nozzle.

The machine consists of a mould wheel, having radial grooves forming the moulds and with matrices going to and fro in the moulds between the central shaft and the periphery, with the orifices of the moulds appearing on the periphery at intervals of about half an inch between them. The mould wheel is a disk of cast iron on which the moulds are built out of separate pieces of steel in such a manner that

the slots formed by these are accurate for the size of type to be produced. The wheel and segments form three sides of the mould. In the moulds the matrices slide and form the end of the mould nearest the centre of the wheel. As the wheel revolves on its vertical axis the entrances of the moulds are in turn presented to the orifice in the shield

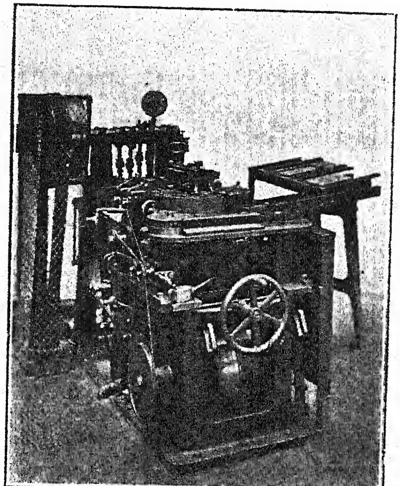


FIG. 8. THE ROTARY TYPE-CASTER.

against which the stream of molten metal is playing. For some three inches each side of this casting point the moulds pass under a top cover, which forms the fifth side of the mould, the sixth being formed by the shield itself. The moulds are filled as they pass the casting point, and subsequently, as the wheel rotates, the matrix is acted on by cams which cause it to advance towards the periphery of the wheel and so eject the type from the mould. In the latest

form of machine the types are cast with one or more deep nicks, an improvement upon the earlier practice. When the type has been ejected about one-sixteenth of an inch it passes in front of a nicking saw, which cuts the nick in the foot; after rotating some distance, other nicks are cut if desired, by saws revolving on a horizontal axis; following the type farther round the wheel, the ejection continues, and when half a revolution has been completed it has been received on the delivery chain, from which it passes under a retaining cam which prevents its return into the mould with the matrix, and having left the wheel entirely it proceeds with the chain into the delivery galley. On each wheel 100 moulds are formed of different sizes corresponding with the inset of the letters, and the varying demand for letters of the respective sets as ascertained from the bills of fount. The delivery chain consists of 100 links in which sliding leaves are fitted, which rise up to receive the type and support it on both sides until it arrives in the galley. When the type has been delivered on the chain, it proceeds between these leaves until it enters the delivery galley, when the leaves fall and the type is pushed along the galley.

Thus the machine casts 100 types of all sorts and sizes at a single revolution, delivering them finished and arranged in line ready for use. No heating up is required, finished type being produced at once. The machine can be stopped immediately, and then re-started without damaging type. This is because the moulds are maintained cold. As a matter of fact, metal from an alloy pot heated to 700° Fahr. becomes a finished type in a fraction of time—1,000 of these being turned out in one minute.

The chief characteristic of this machine is the rapidity with which the finished type is produced in line, thus evolving some theory for the abolition of distribution. In the case of founts in smaller demand, although the process

of casting is equally economical, yet the labour of founting is similar in the case of this machine as in others. The abolition of distribution can be arrived at only where the work to be done is sufficiently large to justify the organiza-

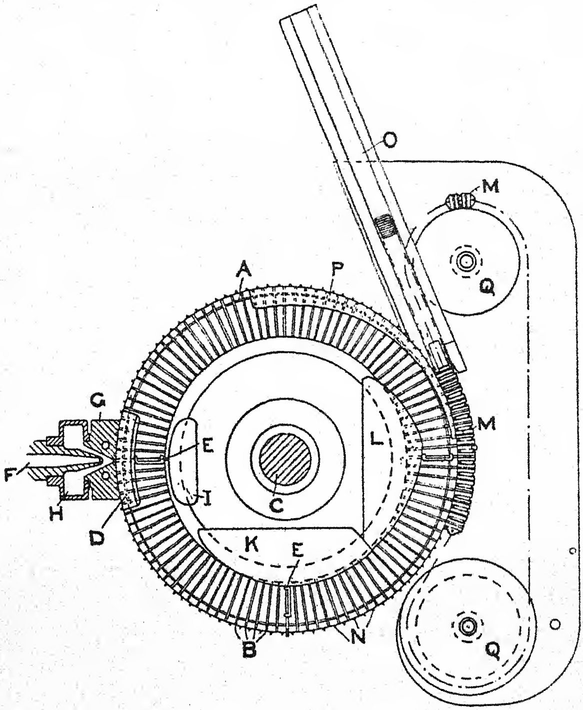


FIG. 9. MOULD WHEEL OF THE ROTARY TYPE-CASTER.

tion necessary to manipulate the output, as, for instance, in the production of "The Times" and "Morning Post" newspapers, where the utility of the machine was first demonstrated by supplying roughly a million types per day at a cost that made distribution unnecessary. Distri-

bution at a speed of 5,000 types per hour is quite superfluous if a machine can produce 60,000 per hour of all sorts.

The mould wheel A, fig. 9, consists of an arrangement of moulds B revolving on a centre column C, and having a stationary top cover D, under which the wheel is free to revolve, the top cover thereby providing a top side to each mould in turn. The moulds B are each provided with a matrix E operated by cams. A nozzle F communicates with a metal pump, a shield G being provided to insure the correct delivery of the molten metal to the matrix E, and also to facilitate the return of surplus metal through the chute H, and thence back to the metal pot. Each matrix is brought into position to receive its charge of metal by the casting cam I; it is then slightly ejected by the cam K for the purpose of groove cutting in the foot, and finally ejected by the cam L, the type being ejected on to the chain M, which is operated by the teeth N on the mould wheel. The chain M delivers the type into the receiving galley O. After ejecting the type on to the chain the matrix is brought back again by the withdrawal of cam P into a suitable position to engage with the casting cam I. Two wheels Q are provided to guide and adjust the chain M.

Type-metal.—The component parts are generally lead, tin, and antimony; this last is used to obtain the requisite hardness and clearness of face, while the tin has the effect of imparting additional toughness to the metal. The proportion of these metals varies according to the size and character of the type to be made. Different founders have their own particular quantities of each kind, sometimes also introducing other metals, but to a very limited extent. Of course the metal used for quadrats and "leads" is of a lower standard in composition—lead forming the greatest bulk in all instances, and especially so in the latter. In the so-called hard metals, the proportion of tin and antimony is increased, and sometimes copper

is added, but very sparingly. For ordinary purposes the following recipes for type metal will be found serviceable:

Moxon:

To 28 lb. metal, 25 lb. lead and 3 lb. of iron and antimony mixed.

Besley:

100 lead, 30 antimony, 20 tin, 8 nickel, 8 copper, 5 cobalt, and 2 bismuth.

Various others:

55 lead, 22·7 antimony, 22·3 tin.

61·3 lead, 18·5 antimony, 20·7 tin.

69·2 lead, 19·5 antimony, 9·1 tin, and 1·7 copper, according to the amount of hardness desired.

The composition of metals used for linotype, monotype, and stereotype work is different from those given above.

Selection of Types.—For good wear and tear, the following points are recommended for consideration: (*a*) That the metal is of such hardness as not to be brittle, and that attention is paid to the size of the type in proportion to the thickness and thinness of its lines. (*b*) That there is a good depth in face; cheap founts of type offered by some founders are sometimes cast from electrotyped matrices, and not from those which are struck from punches, and therefore are more shallow in face. (*c*) That the body is perfectly square and even. (*d*) That there is a good nick or nicks to the fount, to prevent possible mixing with other types, and for facilitating composing. (*e*) That the whole fount, roman and italic, is perfect in ranging; and in ordering additions from time to time, see that the different letters are also in line. (*f*) That the overhanging or kerned letters are well supported from the shank of the letter, to prevent breaking off when giving an impression.

Founts of type are made up to certain scales, called "bills" by type-founders. Taking a complete roman fount

of say 1,000 lb. weight, the lower-case vowels would be made up according to the average use in the English language for an ordinary work; the consonants would be based on this plan too, and the capitals and figures in proportion. Quadrats and italic would be included in a complete fount to the extent of ten per cent. each. There are also schemes for French and other foreign languages. This obviates the possibility of having any great number of letters left on hand when the type has been set up, unless the matter composed is of an exceptional nature. If such is the case, "sorts" must be ordered to level the fount. The following list comprises all the sorts usually supplied with a roman fount; other letters would be extra, and come more properly under the head of "signs" or "peculiars":

Capitals. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Æ Œ

Small Capitals. A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Æ Œ

Figures. 1 2 3 4 5 6 7 8 9 0

Accents, diaeresis. ä ë ï ö ü

" *acute.* á é í ó ú

" *grave.* à è ì ò ù

" *circumflex.* â ê î ô û

Reference marks. * † ‡ § ‖ ¶

Lower case. a b c d e f g h i j k l m n o p q r s t u v w x y z æ œ ﬁ ﬀ ﬂ ﬃ ﬄ

Points. , . ; : ! ? ' - ( ) [ ] — … —— ——

Miscellaneous. & £ / ç ☞

Spaces. Hair, thin, middling, thick.

Quadrats. En, em, one, two, three, and four ems.

Fractions and additional accents are sometimes added, but these are best apart and laid in separate cases. Italic founts as a general rule do not have small capitals, and the figures are usually the same as the roman, with some few exceptions.

Fractions are generally cast in two ways—"whole" and "split." The former are fractional figures cast in one piece, $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$, and the latter those cast on half bodies, $^1{}_4$ $^1{}_2$ $^3{}_4$, etc. The split method allows of many combinations which are hardly possible when the figures are cast in one piece.

Accents, beyond those given in the synopsis of an ordinary fount, consist of many varieties. Some of those in most general use are:

Long. ā ē ī ō ū
Short. ă ĕ ĭ ŏ ŭ
Various. ă g̉ m̃ ñ p̉ p̦ ꝗ, etc.

Signs are of different kinds too numerous to mention in detail. They are grouped under the heads of commercial, astronomical, mathematical, algebraical, geometrical, etc. The explanation of these is outside the scope of this work.

All these signs and peculiars can be obtained in most bodies. The utmost care should be taken of them: they should be kept distinct and in separate cases.

Book-founts may be classed generally as of three kinds, namely, (*a*) the *old faced*; (*b*) the revived *old style*, of somewhat lighter face and more regular appearance; (*c*) the *modern* face. Each variety has its distinctive character of italic, and the modern faces are subject to a great number of designs, some better than others. Again, the work of the Kelmscott Press has created many imitations, some of which are not always happy in their design. We here give, in pica, an average example of the three classes:

Old face. ABCDEFGHIJKLMNOPQRST
UVWXYZÆŒ
ABCDEFGHIJKLMNOPQRSTUVWXYZÆŒ
1234567890
abcdefghijklmnopqrſstuvwxyzæœ&ct;ffflſt
ABCDEFGHIJKLMNOPQRST
UVWXYZÆŒ
abcdefghijklmnopqrſstuvwxyzæœſiſſſlſtſhſb

Old Style. ABCDEFGHIJKLMNOPQR
STUVWXYZÆŒ
ABCDEFGHIJKLMNOPQRSTUVWXYZÆŒ
1234567890
abcdefghijklmnopqrstuvwxyzæœfifffl
ABCDEFGHIJKLMNOPQR
STUVWXYZÆŒ
abcdefghijklmnopqrstuvwxyzæœfifffffi

Modern. ABCDEFGHIJKLMNOPQRST
UVWXYZÆŒ
ABCDEFGHIJKLMNOPQRSTUVWXYZÆŒ
1234567890
abcdefghijklmnopqrstuvwxyzæœfifffl
ABCDEFGHIJKLMNOPQRS
TUVWXYZÆŒ
abcdefghijklmnopqrstuvwxyzæœfifffffifl

The difference in the *figures* should be particularly observed—the old face and old style having the quaint ascending and descending strokes, the modern ranging at the top and bottom:

1 2 3 4 5 6 7 8 9 0

1 2 3 4 5 6 7 8 9 0

Occasionally the old figures are used with modern founts, but we think it advisable that they should be kept as distinct as possible, although, in a mass, the old face figures are decidedly more readable.

It is somewhat interesting to remember, with regard to *italic*, that these characters were invented by Aldus Manutius, a Venetian printer who flourished about 1449-1515, and that roman capitals were first used with the italic lower-case. The italic used by Aldus is usually supposed by some authorities on the subject to have represented the handwriting of Petrarch, and assumed a much more running or scroll-like character than that used nowadays.

The following types of Messrs. Caslon and Co. give an idea of some of the old italic founts, with the tails and flourishes:

A B C D E F G H I J K L M N O P Q R
S T U V W X Y Z Æ Œ

a b c d e f g h i j k l m n o p q r s t u v w x y z æ œ

The somewhat fanciful capitals were sometimes called "swash" letters.

Black-letter next requires our consideration, and the five samples added here will give some idea of the different faces of that character in use:

Caxton, 15th century.

A B C D E F G H I J K L M
N O P Q R S T U W Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z

Old English, 16th century.

A B C D E F G H I K L M N O
P Q R S T U W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z

Tudor, 17th century.

A B C D E F G H J K L M N O P
Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z æ œ

Old Flemish, 18th century.

A B C D E F G H I K L M N
O P Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z

Modern-faced Black letter, 19th century.

A B C D E F G H I J K L M N
O P Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z æ œ

The dates given are only approximate, but the types shown on the preceding page convey a good impression of the black-letters that came into use at various times.

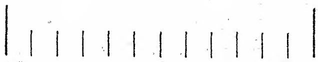
The first specimen shown here is that of the Caxton period, the type which that printer probably brought with him from Bruges. Artistically, the second is really the best, and is practically a copy of the pointed black-letter used for the Gutenberg 42-line Bible, which is said to be the first book printed from movable types. It was copied with some modifications later on, and used by Wynkyn de Worde, Caxton's successor.

The type used in the third example is a revived form of the round Gothic or black-letter character, similar to that used by Gunther Zainer of Augsburg at the end of the fifteenth century, and exhibits at a glance the transition of the Gothic character to roman letter.

The fourth specimen is of Flemish origin, and was designed by Fleischman in 1743; it is somewhat more ornate in design than the accepted form of black-letter. The fifth and last example is a specimen of modern black-letter, but of a somewhat degenerated character; it certainly is not to be compared with the others for beauty, and should be avoided as far as possible.

Jobbing types are to be obtained of all kinds, some good, others bad or indifferent, and we propose to show only a few of those faces mostly in demand, which may fairly be considered to meet with general approval. Unfortunately the fanciful names applied to these types cannot always be relied on, for some letter-founders may have the same or similar characters in their specimen-books, but designated by an entirely different name. Broadly speaking, the thicker-faced type used in dictionaries to give emphasis to the reference word is classed as "Clarendon," whereas the older and uglier form of fat-faced letter is termed "Egyptian." But what one founder would call "Clarendon,"

thickness. A fount is considered of fair size when the whole alphabet of twenty-six letters, lower-case a to z, extends to or exceeds twelve ems of its own body, thus:



abcdefghijklmnopqrstuvwxyz

If the alphabet comes within the twelve ems, an extra charge is involved, according to a provision in the scale of prices for composition, and it consequently ranks as a "thin fount." Therefore it is necessary that a purchaser should be careful in selecting a new fount, in order to obviate this extra charge being made.

In type-founder's language each portion of a single letter has a distinctive name, as shown in the following sketch, fig. 10:

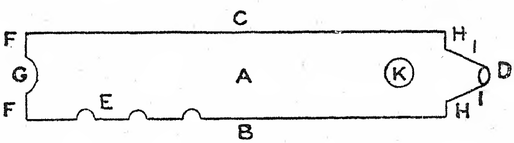


FIG. 10. PARTS OF A TYPE NAMED.

A The body or shank.	F The feet.
B The belly or front.	G The groove.
C The back.	H The shoulder.
D The face.	I The bevel or beard.
E The nicks.	K The pin-mark.

A *kern* is that part of a letter which overhangs its body, as in a lower-case f. This is frequently met with in italic founts, owing to the sloping nature of the characters. *Serifs* are the fine lines on the top and bottom of letters; the two samples show respectively a letter with and without serifs:

H H

The faces of letters, taking lower-case as an illustration, are classified into four divisions:

Short letters.

a c e m n o r s u v w x z

Long letter.

j (this occupies the whole depth of face).

Ascending letters—upstrokes.

b d f h i k l t

Descending letters—downstrokes.

g p q y

The capitals, and figures too (in a modern fount), would be described as ascending letters, whereas the small capitals would be classed as short. The only exception to these rules would be the capital Q, which would be a long letter, as in the case of the lower-case j.

Bastard founts, or founts in which the face is of one size while the body is of another, are sometimes cast to obviate the necessity of leading works. They economize the cost of composition, because in casting-up, supposing the type has a small pica face on a pica body, it would reckon as only small pica in width, but pica in depth. It is usual to have the face one remove only from the size of body, but of course there are exceptions to this rule.

Nicks in English types are on the front or belly of the letter, but the system of the French and most other continental nations is to have the nick on the back, and their standard as regards "height to paper," *i.e.*, the height as the letter stands from the feet to the face, is slightly higher than ours. Indeed, our heights vary slightly according to

the several founders, but the difference is infinitesimal. It is a matter for regret that the depths of bodies are not always the same in this country, but this state of affairs is now being gradually remedied. Roughly speaking, the height of type is equal to that of a shilling standing on its edge. But it must be borne in mind that usually the types cast by the Scotch foundries are of a slightly different height from those of the English houses, but some firms cast both to English and Scotch heights according to order. This variation also applies to the types emanating from foreign foundries.

Some of the types in use at the Oxford University Press are cast to different standards in height, which is due to the fact that its collection is so varied.

Taking the five leading founders of the present day,[1] we find the standard of pica is about the same, 72 to the foot, but the other sizes vary, especially the long primer, as the following will show:

Caslon and Co. . . .	89·5	to the foot.
Figgins	90	,,
Miller and Richard / Stephenson, Blake, and Co.	89	,,
Reed and Sons . . .	92	,,

The remaining sizes are dependent very largely on these variations in long primer.

The following specimen page of types of Messrs. Miller and Richard's old style will give the difference in face of most of the sizes enumerated later on; the exact depth of body, old standard, is given at the side, by the insertion of a single letter of the same fount in each line turned upside down.

[1] Caslon and Co.; V. and J. Figgins; Miller and Richard; Stephenson, Blake, and Co.; and Sir Charles Reed and Sons, now incorporated with the firm of Messrs. Stephenson, Blake, and Co.

Canon is the

Two-line Great Pr

Two-line English is

Double Pica is the size of

Great Primer is the size of this typ

English is the size of this type, which is

Pica is the size of this type, which is equivalent

Small Pica is the size of this type, which is equivalent

Long Primer is the size of this type, which is equivalent to

Bourgeois is the size of this type, which is equivalent to two of

Brevier is the size of this type, which is equivalent to two of Gem, or

Minion is the size of this type, which is equivalent to one half of English, or

Nonpareil is the size of this type, which is equivalent to one half of Pica, or one

Ruby is the size of this type, which is equivalent to one half of Small Pica, or one quarter of

Pearl is the size of this type, which is equivalent to one half of Long Primer, or one quarter of

The following table gives the names of the book-founts (old bodies) in general use, with their nominal relation to each other. Where blanks are left there are no real equivalents:

Minnikin			
Brilliant			
Gem	*is* half of Brevier		
Diamond	half of Bourgeois		
Pearl	half of Long Primer		
Ruby	half of Small Pica		
Nonpareil	half of Pica		
Emerald	half of Two-line Emerald		
Minion	half of English		
Brevier	half of Two-line Brevier	*or* two of Gem	
Bourgeois	half of Great Primer	two of Diamond	
Long Primer	half of Paragon	two of Pearl	
Small Pica	half of Double Pica	two of Ruby	
Pica	half of Two-line Pica	two of Nonpareil	
English	half of Two-line English	two of Minion	
Great Primer	half of Two-line Great Primer	two of Bourgeois	*or* four of Diamond
Paragon	half of Two-line Paragon	two of Long Primer	four of Pearl
Double Pica	half of Two-line Double Pica	two of Small Pica	four of Ruby
Two-line Pica	half of Canon	two of Pica	four of Nonpareil
Two-line English	two of English	four of Minion	
Two-line Great Primer	two of Great Primer	four of Bourgeois	eight of Diamond
Two-line Paragon	two of Paragon	four of Long Primer	eight of Pearl
Two-line Double Pica	two of Double Pica	four of Small Pica	eight of Ruby
Canon	two of Two-line Pica	four of Pica	eight of Nonpareil

Larger sizes of type are made, but they are designated by the number of picas the body is equal to, such as five-line, six-line, etc. Founts are generally cut in wood when they reach eight or nine lines of pica in depth of body.

Spaces of various degrees, used generally to divide words, and quadrats to fill up short lines, which are cast to regular sizes, complete a fount in the ordinary way. Hair spaces, the thinnest of all, are cast perhaps eight to an em of their own body; sometimes they are made thinner or thicker. Taking long primer, in which this work is printed, as our standard, the spaces here shown give the width:

hair space	thin space	middling space	thick space
8 to em	5 to em	4 to em	3 to em

Quadrats of the same body:

en	em	2 em	3 em	4 em

The following suggestions may be of service:

Hints on Ordering Sorts.—The following table contains a rough estimate (taking Brevier as a standard) of the amount which the respective boxes of the regular full-sized lower case will contain; the first two columns give the letters and weight only, the last two columns the letters and number that will weigh a pound.

Letters.	Weight to Box.	Letters.	No. Letters to lb.
a c d i s m n h o u t r	2 lb.	a b d g h k n o p q u v x y z	582
f b l v g y p w	15 oz.	c e r s t	682
k j z x q and figures	6 oz.	m	398
e	3 lb.	f i j l	850
Capitals	5 oz.	Periods and Commas	1400

Weight of Type required for a Job.—To find this, divide the area of the page expressed in pica ems by 144. The answer gives the number of pounds weight in the page. 50 per cent. for small founts, and 30 to 40 per cent. for large founts, should be added to allow for sorts, etc.

Example: I have to set fifty pages of Brevier, octavo, the size of the page in pica ems being 20 × 34. What weight of type should I order?

The area of each page is 20 × 34, equal to 680 ems pica; divide by 144 and multiply by the number of pages, 50. The result is, say, 236. Add 40 per cent., and the sum will be about 330 lb. *Ans.*

Another method is to take four square inches of type, *set solid,* to the pound, as an approximation. If *leaded* the difference must be allowed for, and the number of leads deducted according to the poundage scale for leads on page 49.

There was a time when book-founts were considered fairly large if they consisted of a 1,000 lb. weight, but the present day requirements demand founts sometimes of several tons in weight; in fact, a fount of 10,000 lb. is by no means a large one, and can only be considered of a medium size. A firm undertaking bookwork is frequently expected to get a complete work in type at one time, even if it makes two or three volumes, and, moreover, the printer often has to keep it standing indefinitely; so that any one establishment may have many volumes standing at the same time.

To give an idea of the weight employed in an average volume, take a crown octavo novel of 10 sheets of 32 pp. = 320 pp. in all, as an instance; it may be assumed that practically a ton of type would be required for such a volume if set solid.

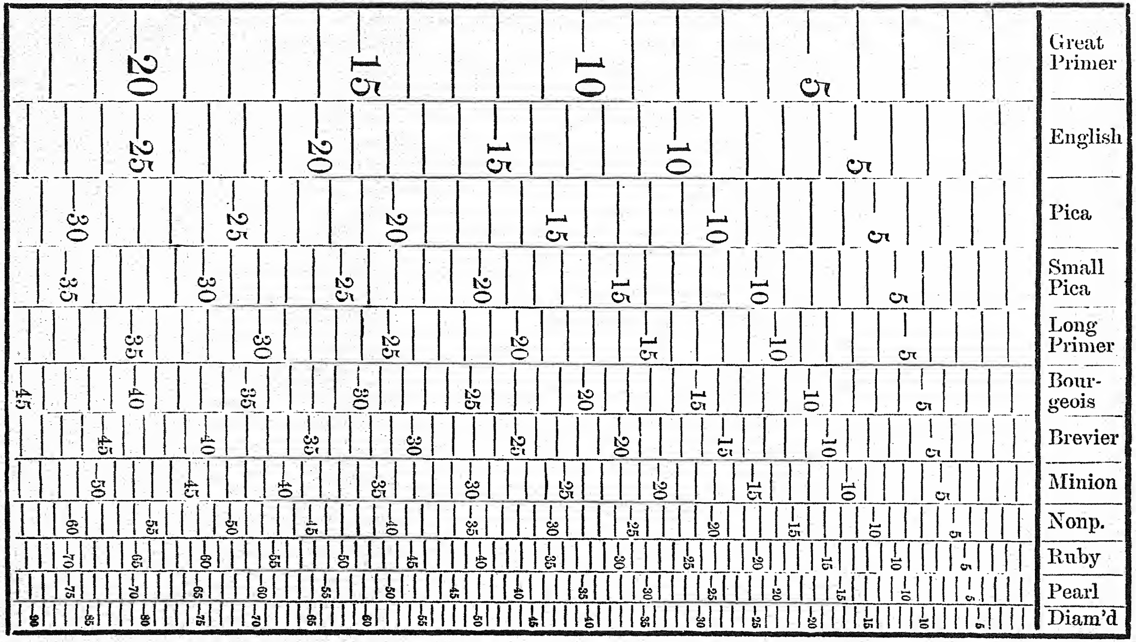
A Square Inch of Type.—It is not always, when asked for an estimate, that the printer has at hand the means of

making it. He has mislaid his graduated scale, or the matter to be cast off is in awkward batches. A ready means, however, has been suggested. It has been calculated that a square inch of pica contains 36 ems; of small pica, 49 ems; long primer, 56 ems; brevier, 86 ems; minion, 100 ems; nonpareil, 144 ems; and ruby, 196 ems. Any fractions in the calculations should be considered as being in favour of the printer.

Ordering Sorts.—The twelve square boxes directly in front of the compositor, containing the letters a, c, d, i, m, etc., will hold about 2 pounds each. The boxes half the size of the "a" box will hold 15 ounces each, containing the letters f, b, g, l, p, etc. The small square boxes containing the letters k, j, q, etc., will hold 6 ounces each. The "e" box 3 pounds, and the cap. case 5 ounces to the box. The best way to order sorts for display type is to do so by "irons." A typefounder's iron is about 20 pica ems long.

Special Sorts.—Where do they all go to—such as fractions, reference marks, accents, italics, etc.? Every employer who has had much book or news work that called for any quantity of these sorts has had the problem put plainly to him by the frequent demand for fresh supplies. On inquiry, he has traced their disappearance to the laziness of some employés, who, not thinking that these sorts are likely in an emergency to be very valuable, either throw them into the quad box, or scatter them promiscuously and recklessly about in the upper case, a practice to be condemned.

The following plan gives some of the type bodies at a glance, Messrs. Miller and Richard's standards for old bodies being used. Every fifth line is numbered, and each column is two ems wide of its own body. From this diagram it will be seen that English, Long Primer, Brevier, and Minion bear no precise relation to the other sizes. On the other hand founts cast on the point system bear a definite proportion to each other.



Great Primer
English
Pica
Small Pica
Long Primer
Bourgeois
Brevier
Minion
Nonp.
Ruby
Pearl
Diam'd

The *Point System* is gradually, nay fast coming into use in this country, and is an ideal one for type bodies, fig. 11. Without going into decimals, the system may be explained as follows. Pica, which is roughly seventy-two to the English foot, is the basis of twelve points. The smaller sizes are graduated by half points, the middle sizes by one point, and the larger by two or more points. For jobbing purposes the system allows of a very ready justification of one body with another, and it is in that particular branch of work that it has been largely adopted. At the same time it simplifies all composition of book-founts, and has the effect of co-ordinating the various bodies which have hitherto been a source of vexation to the printer.

The following table gives approximately the equivalent bodies under the old and point systems.

Old System.	*Point System.*	*Old System.*	*Point System.*
Excelsior . .	3-point body.	2-line Lg. Prim. / Paragon . .	20-point body.
Brilliant . .	3½ ,, ,,	2-line Sm. Pica	22 ,, ,,
Semi-Brevier .	4 ,, ,,	2-line Pica . .	24 ,, ,,
Diamond . .	4½ ,, ,,	2-line English.	28 ,, ,,
Pearl . . .	5 ,, ,,	5-line Nonprl.	30 ,, ,,
Agate . . .	5½ ,, ,,	3-line Sm. Pica / 4-line Brevier .	32 ,, ,,
Nonpareil . .	6 ,, ,,	2-line Gt. Prim. / 3-line Pica . .	36 ,, ,,
Minion . . .	7 ,, ,,	Dbl. Paragon .	40 ,, ,,
Brevier . . .	8 ,, ,,	7-line Nonprl.	42 ,, ,,
Bourgeois . .	9 ,, ,,	4-line Sm. Pica / Canon . . .	44 ,, ,,
Long Primer .	10 ,, ,,	4-line Pica . .	48 ,, ,,
Small Pica . .	11 ,, ,,	5-line Sm. Pica / 9-line Nonprl.	54 ,, ,,
Pica	12 ,, ,,	5-line Pica . .	60 ,, ,,
2-line Minion . / English. . .	14 ,, ,,	6-line Pica . .	72 ,, ,,
2-line Brevier .	16 ,, ,,		
Great Primer . / 3-line Nonprl.	18 ,, ,,		

Two other features in connection with the point system are those of the *Standard Line* and *Unit Set*, as applied to

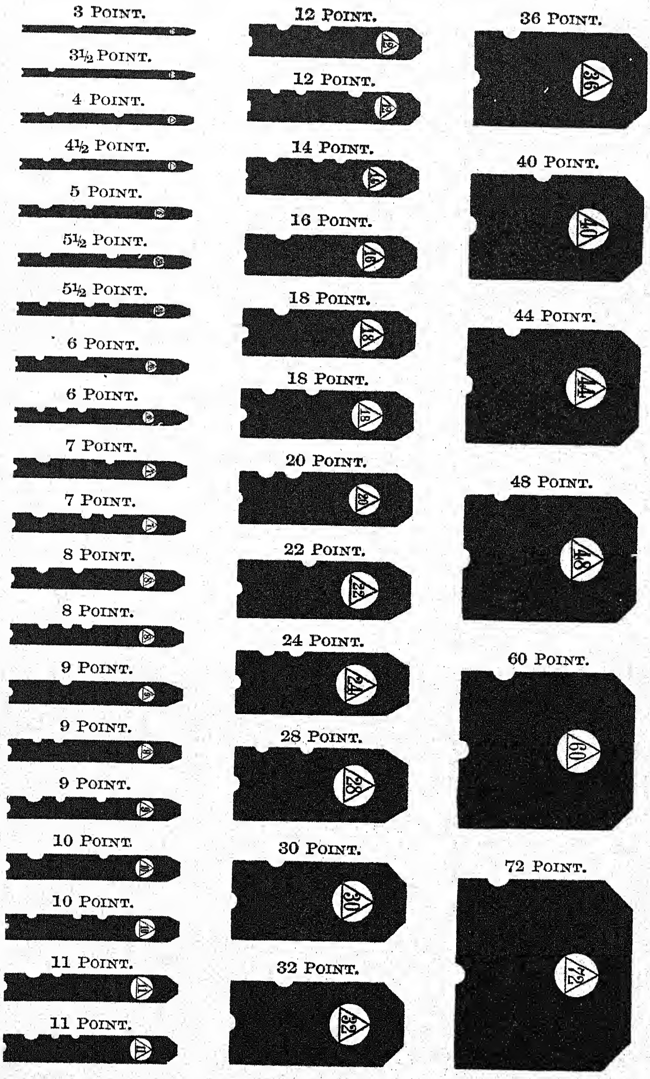


Fig. 11. POINT BODIES ON THE AMERICAN SYSTEM.

all the letters comprising any one size of body; sometimes founts under this system are called *Commensurable Types*. The standard line refers to the equal alignment of the different faces on any one body, so that these various faces range at the foot, whether of the ordinary roman or

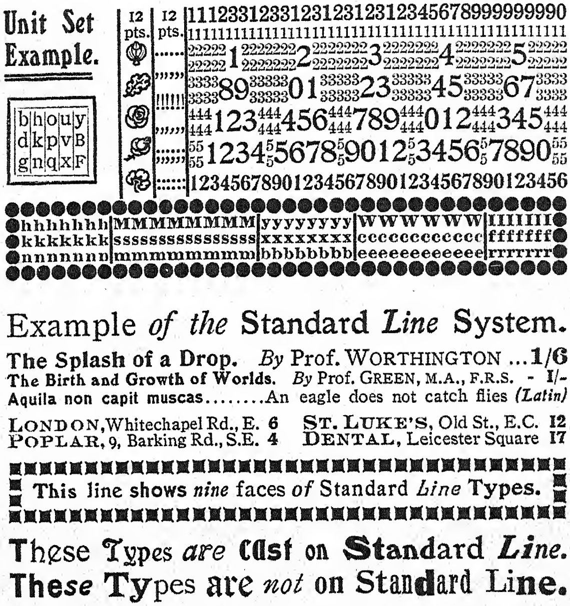


FIG. 12. EXAMPLE OF STANDARD LINE AND UNIT SET LETTERS.

of the clarendon order. The unit set refers to the precise lateral width of each letter of the alphabet, or, rather, any letter of a given fount, each different letter being cast to a specified number of units, these units being points or fractions of points both in alignment and in width, fig. 12.

By the adoption of these three methods the standardization of types is rendered an easy matter, and thus allows

of a perfect justification of one size with another, not only in depth but also in width. That the point system, as far as the depth of bodies is concerned, is an ideal one will be admitted by all; but we venture to think that perhaps the standard line and unit set methods are not of such importance, for these definite measurements must somewhat limit the artist's scope in designing any alphabet.

The old bodies of type often necessitated the use of leads and sometimes pieces of card to make justification possible, but at the best it was an unsatisfactory means to an end. In starting new printing offices it is strongly advisable to have everything in connection with the composing department, including furniture, leads, brass rule, borders, and ornaments of all kinds, on this point system, as much trouble and vexation will be avoided, for under the old system the same sizes of types by the various foundries differed as already shown, which created endless confusion when the same nominal bodies were used together.

COMPOSITION AND DISTRIBUTION

CHAPTER II

Materials, Tools, and Appliances used—Varieties of Frames and Cases—Different kinds of Composing Sticks, Setting Rule, and Galleys—Leads—Brass Rules of Plain and Fancy Character—Furniture, Wooden and Metal—Quoins—Patent Locking-up Apparatus—Mallet, Planer, and Shooting Sticks—Chases, Imposing Surfaces, Forme and Letter-Board Racks—Galley Proof Presses—Rule and Lead Cutter—Bodkin, Tweezers, and Shears.

BEFORE proceeding to the matter of type-setting, it is necessary to give the student some idea of the materials, tools, and other appliances required in this department, and the illustrations here given, with short descriptions, will make clear the use to which they are put.

To commence with, we have the *composing frames* of various kinds. The old kinds are usually made of deal, and stand breast-high, forming a stand to hold the type-cases at a proper angle for the most comfortable position in picking-up types, the upper case lying at a more acute angle than the lower case, in order that the compositor may easily reach the topmost boxes in the upper case without having to stretch too far. The best kinds are those which are made in sections and bolted together. These frames are generally made with a rack to hold the cases not in immediate use, but likely to be required.

The *double frame*, fig. 13, holds two pairs of cases, and has two sets of racks for cases, which hold five pairs in each, making a total of twenty in all. This is a good and serviceable frame where rack-room is a consideration.

The *whole frame*, fig. 14, however, is one more in general use; it has only one case-rack, which holds five pairs, and the frame-stand itself is somewhat shorter. The remaining portion of the frame is occupied by a shelf called the "bed of the frame," which is very handy for surplus

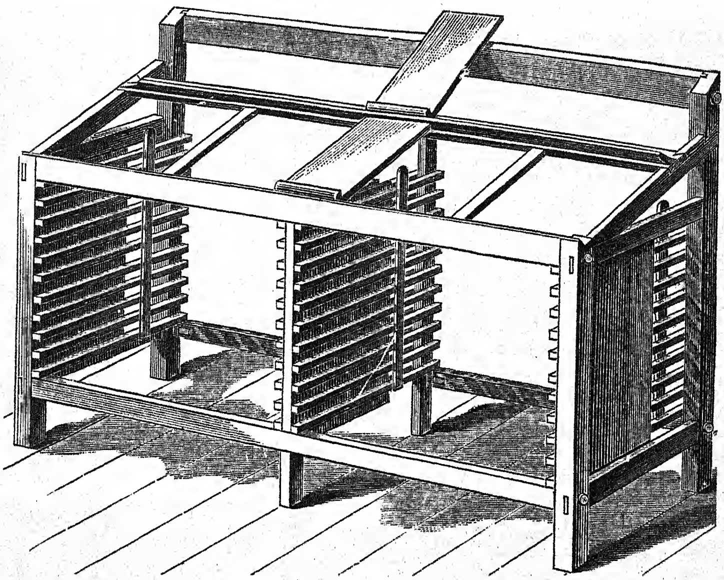


FIG. 13. DOUBLE FRAME.

"sorts" turned out in distribution, and for various other things. This frame holds two pairs of cases up for immediate use, as does the double frame. Sometimes, when these larger frames are standing back to back, as is usual in a large printing office, the space between the two is utilized for galley-racks.

The *three-quarter frame*, fig. 15, is a little longer than

the half-frame, and holds up one pair of cases, having a case-rack for five pairs not in actual use. They may also be made with galley- instead of case-racks.

The *half-frame*, fig. 16, is simply a small stand for one pair of cases up, with no case-rack, but it has a good sized shelf or bed to it near the foot, useful for many purposes.

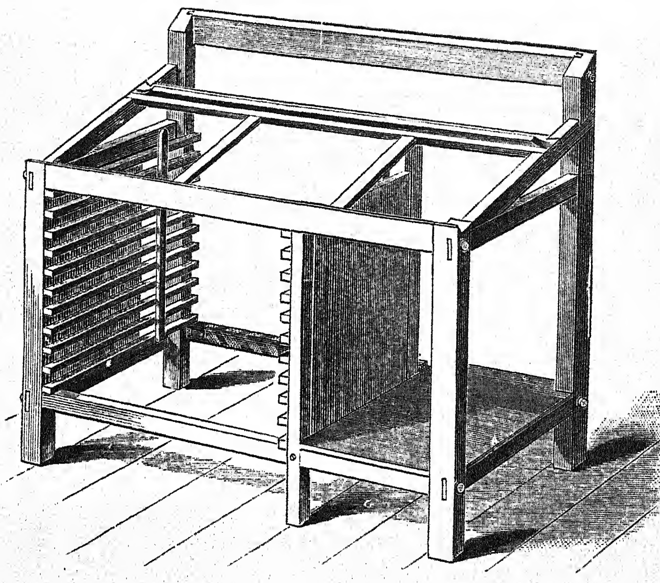


FIG. 14. WHOLE FRAME.

This frame is handy for holding italic cases on, because it can stand in any out-of-the-way corner, where there is not sufficient room for a three-quarter or double frame. There are, in addition to these, several other kinds of frames made for making-up purposes, called *random frames*, and others with special drawers or cupboards constructed to order, according to the requirements of any particular office.

In recent years many improved frames and other appliances have come into use which are economical as regards space occupied, and have the effect of keeping the type-cases and other things dust proof to a great extent. Many of these innovations are due to American enterprise, and are well worth consideration, especially for new offices.

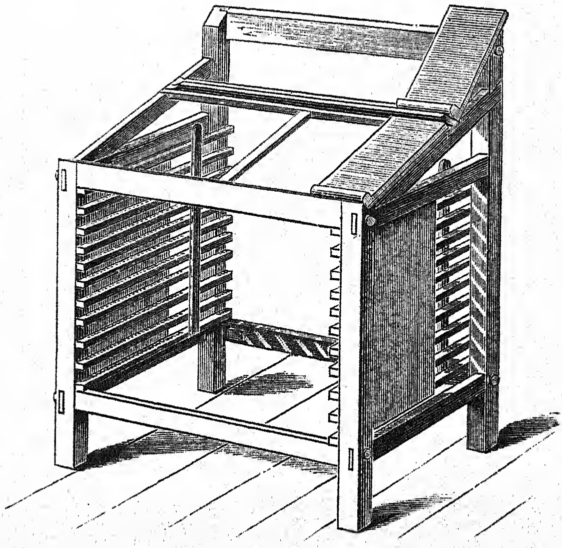


FIG. 15. THREE-QUARTER FRAME.

The principal object is, as said before, both space and labour saving. For instance, we have the so-called *New York frame*, fig. 17, of which kind there are many other varieties to be obtained.

The one shown on p. 41 is a quadruple frame with two double case-racks. It will be noticed that the stands or arms for the cases are made of iron brackets instead of wood.

Type-cases themselves are usually made of teak, and the

bottom board of the case is lined with smooth white paper before the divisions forming the boxes are fastened on. By this means the cases are kept cleaner, and made more comfortable for picking up the type when the letter is set low. There are other cases with special features in their manufacture, such as three-ply bottoms, which impart great

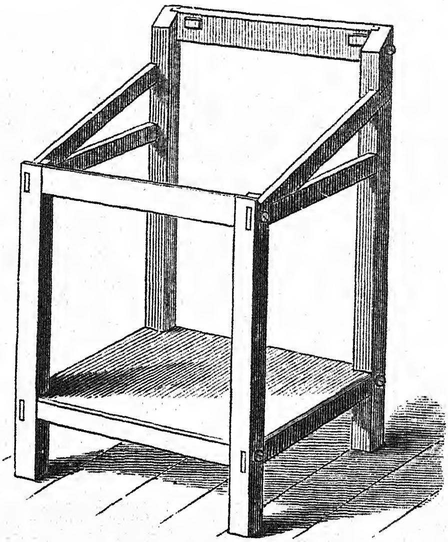


FIG. 16. HALF FRAME.

strength to the case. The respective corners of the different boxes are also fastened with a small brass clamp which has a pin driven right through, thus pinning the partitions firmly to the bottom of the case.

There are two cases used for ordinary bookwork, called *upper* and *lower* case, which contain the capitals and the smaller letters respectively.

Though English cases are always made with the same num-

ber of boxes or divisions, the "lay," of which we shall speak presently, varies according to fancy and requirement for any particular class of work. The upper case has 98 boxes, and the lower case 53 boxes. To the letter *e* is allotted the largest box in the lower case, and the other vowels and consonants most frequently used are placed in the next size of division.

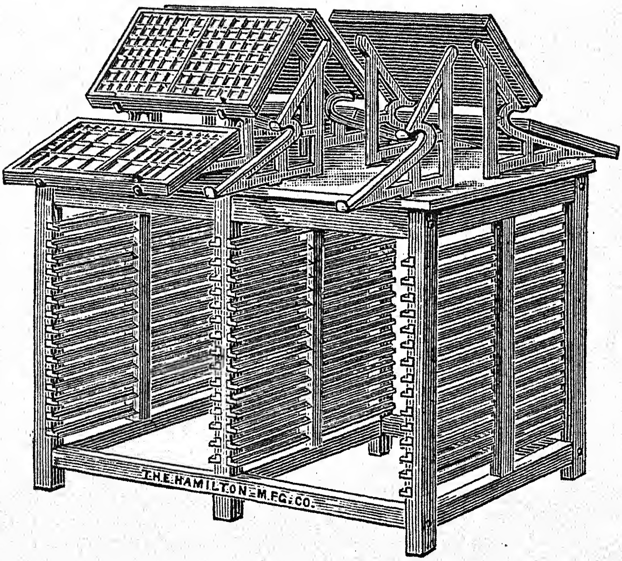


FIG. 17. NEW YORK QUADRUPLE FRAME.

These boxes are situated according to the demand for the different letters in setting-up ordinary works. For instance, the compositor stands at the centre of his case, and of course it is reasonable to suppose that those letters most frequently in use, as the vowels *a e i o*, and the consonants *t n d h*, should be nearest to his picking-up hand, in order to save time in conveying the letter from the box to the

composing stick. The diagrams, figs. 18 and 19, show the plan of the ordinary upper and lower cases. The "lay" will be dealt with later on.

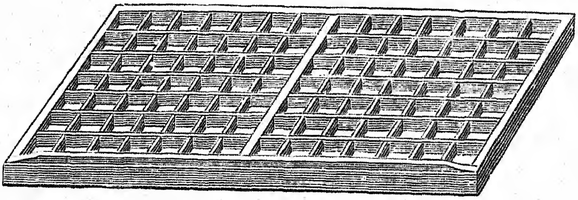


FIG. 18. UPPER CASE.

For jobbing purposes, when the founts happen to be not very large, special cases are used, and, amongst others,

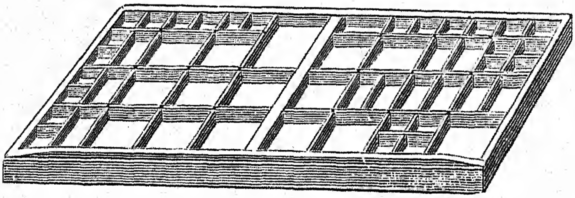


FIG. 19. LOWER CASE.

double cases, upper and lower cases combined, fig. 20, and *treble* cases, similar to three upper cases all in one, fig. 21, are

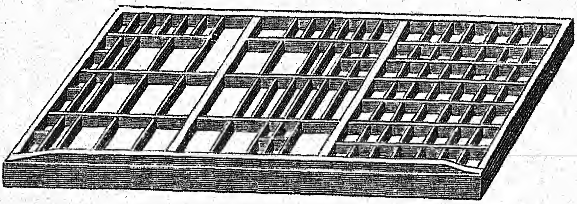


FIG. 20. DOUBLE CASE.

manufactured, and found very useful. Other varieties are made for four or six founts in one case, and some for brass rule and leads. Hebrew, Greek, and other languages having

special characters require cases of different construction as regards the boxes. These will be dealt with in Chapter XI.

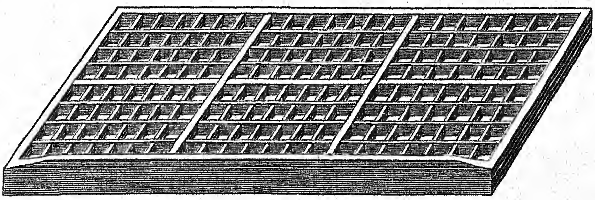


FIG. 21. TREBLE CASE.

There are also various other suggestions for cabinets so that leads, reglet, or furniture may be kept in their separate

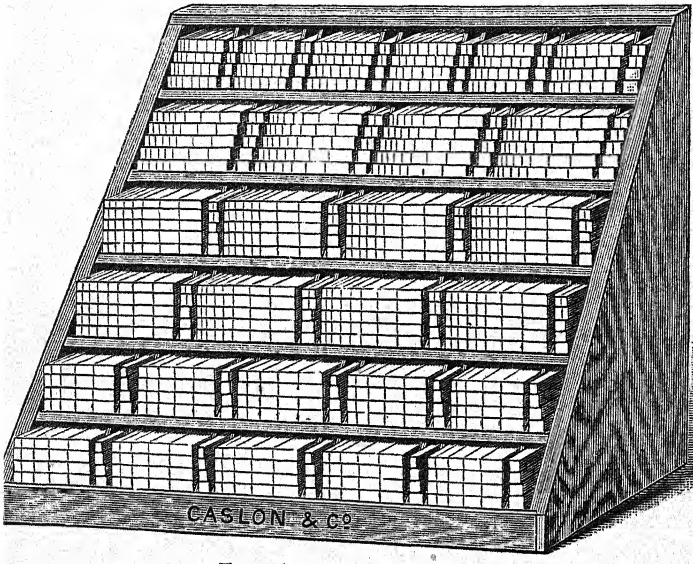


FIG. 22. FURNITURE CABINET.

places, as well as in their respective sizes, which represents a great saving of time. Fig. 22 is a so-called labour

saving furniture cabinet, and the idea should be sufficiently obvious to even the most unpractical person.

Fig. 23 represents one of a pair of lead and reglet cases intended to stand together, and marked with the various measures or lengths in pica ems. These too are equally serviceable.

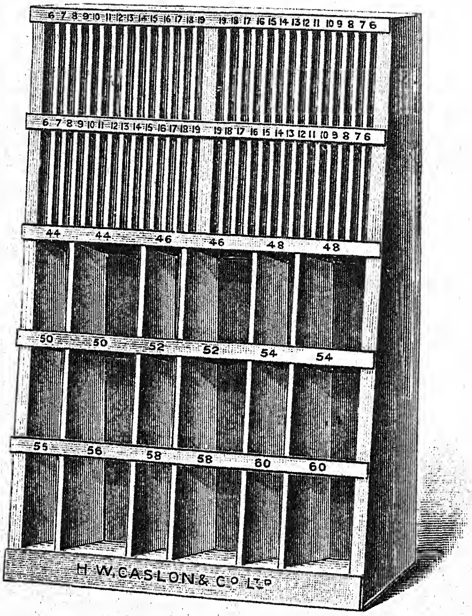


Fig. 23. LEAD AND REGLET CABINET.

The composing stick, figs. 24-28, is the tool used for typesetting. It is made in various metals, but generally of iron or gun-metal for bookwork. For newspaper work short mahogany sticks, fig. 27, are sometimes employed; they are lined with metal (usually brass), and the measure is of course fixed. For poster or broadside work long sticks,

fig. 28, made entirely of a hard wood are used. To the metal bookwork composing sticks a movable slide is attached,

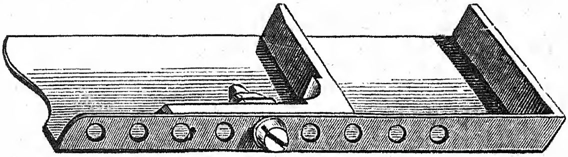


FIG. 24. STICK WITH SLOTTED SCREW.

which can be adjusted to any measure within the length of the stick. These slides are fastened usually by means of a

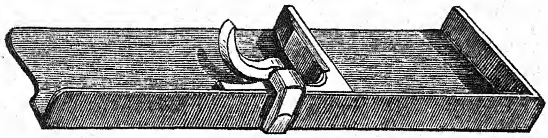


FIG. 25. STICK WITH LEVER.

slotted head-screw, as in fig. 24, but for jobbing purposes a lever, fig. 25, or thumb-screw, fig. 26, is sometimes substi-

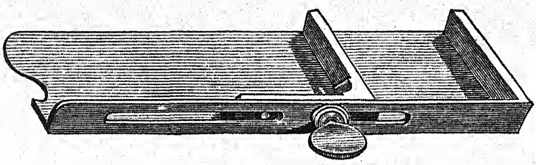


FIG. 26. STICK WITH THUMBSCREW.

tuted; these allow of more rapidly changing the measure. The illustrations now given show the many varieties in use at the present time.

In order to set up the type easily and smoothly we have in connection with the composing stick the *setting rule*, fig. 29, which is placed within the stick for the type to lie

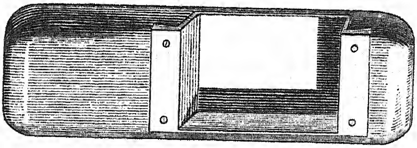


FIG. 27. WOODEN STICK, METAL LINED.

against as it is being set. It is generally made of four-to-pica brass rule with a nib or nose-piece usually at one end,

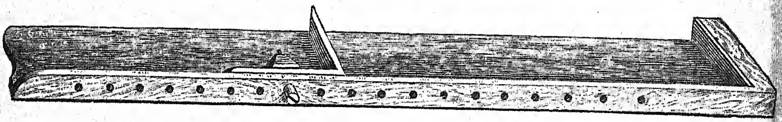


FIG. 28. BROADSIDE STICK.

but sometimes at both ends, to allow of its being more readily lifted out and placed in front of the line just set and

FIG. 29. SETTING RULE.

justified. Its use is to facilitate the setting of the type, as it permits the letter, when placed in the stick, to slide more readily into its position, and as each line is composed it is placed in front of the one just finished. It also assists in emptying the type out of the stick on to the galley—especially when the matter is set "solid," *i.e.*, without leads.

It may be said here that "matter" is another word for composed type, and also that "setting" is the term applied to the act of composing.

When the stick is full, it has to be emptied on to a *galley*, fig. 30. These receptacles are generally made of mahogany for bookwork, and for newspaper work or slip matter of brass, or more frequently of zinc. In the wooden kinds we have slip, octavo, quarto, and folio galleys. It is desirable that well-seasoned wood be obtained, for they are

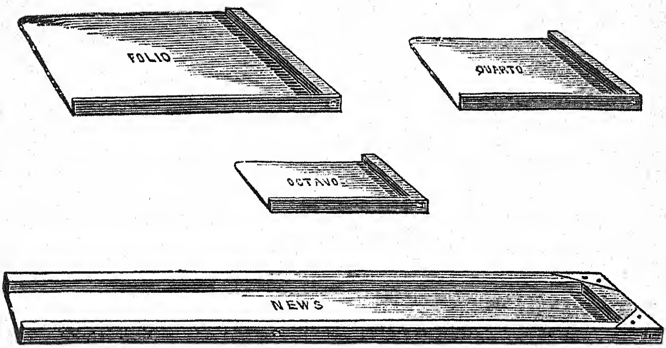


FIG. 30. VARIOUS GALLEYS.

very apt to get twisted or warped. Old wainscoting makes an admirable galley in all respects. Type matter for distribution should never be wetted whilst on wooden galleys; metal ones should be used for that purpose.

The patent metal *column galley with quoins*, fig. 31, shown on the next page, is certainly an advantage for slip matter, and especially so for newspaper or magazine work. The quoins are made of metal, and are fixed into an angular slot at the side of the galley—furniture, metal or wood being used in place of the ordinary sidestick. As will be seen, the slot gives ample room for loosening or tightening

the quoins, of which three are sufficient for each galley. Practically this patent is a self-locking galley, and is made in both brass and zinc, and in all sizes. By the use of these galleys much time is saved.

Leads, fig. 32, are slips of metal of different thicknesses and cut to various lengths; these are used for placing between the lines if the work is required to be "leaded." They are made of less brittle metal than type, and are therefore more pliable. They are cast so many in thickness to a pica, from four to sixteen to a single em of pica body.

Nonpareil lead
(6-point)

Thick lead
(3-point)

Six-to-pica lead
(2-point)

Eight-to-pica lead
(1½-point)

FIG. 32. SOME LEADS.

Technically speaking, a *thick lead* is four to pica; a *thin lead* eight to pica; and *hair leads* perhaps fourteen to sixteen to a pica. Besides these sizes there are twelve, ten, and six to pica leads. Leads are cut to pica ems in length, except in the case of special half-measures, that is, a given number of ems with an en added for double column matter of a narrow measure. The following schemes are handy for ordering quantities:

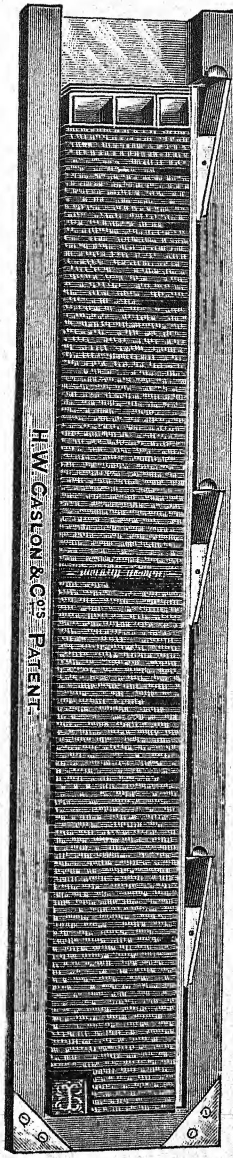


FIG. 31. PATENT GALLEY.

Number of Leads in a Pound.

Lengths.	4 to Pica.	6 to Pica.	8 to Pica.	Lengths.	4 to Pica.	6 to Pica.	8 to Pica.
4 ems	144	216	288	26 ems	22	33	44
5 ems	112	168	224	27 ems	21	31	42
6 ems	96	144	192	28 ems	20	30	40
7 ems	82	123	164	29 ems	20	30	40
8 ems	72	108	144	30 ems	19	29	38
9 ems	64	96	128	31 ems	19	28	38
10 ems	56	84	112	32 ems	18	27	36
11 ems	52	78	104	33 ems	17	26	34
12 ems	48	72	96	34 ems	17	25	34
13 ems	44	66	88	35 ems	16	24	32
14 ems	41	61	82	36 ems	16	24	32
15 ems	38	57	76	37 ems	15	23	30
16 ems	36	54	72	38 ems	15	22	30
17 ems	34	51	68	39 ems	15	22	30
18 ems	32	48	64	40 ems	14	21	28
19 ems	30	45	60	41 ems	14	21	28
20 ems	28	42	56	42 ems	14	21	28
21 ems	27	40	54	43 ems	13	20	26
22 ems	26	39	52	44 ems	13	19	26
23 ems	25	37	50	45 ems	13	19	26
24 ems	24	36	48	46 ems	12	18	24
25 ems	23	34	46	47 ems	12	18	24

Weight of Leads Required for a Job.—Multiply the number of lines in a page by the number of pages to be leaded, and divide the product by the number of leads of the measure required that weigh a pound.

Example: I have to lead (8-to-pica) 24 pages of matter set to 21 ems pica, there being 35 lines to the page. How many pounds of leads shall I want? In the table I find 54 8-to-pica leads, 21 ems long, weigh a pound. Therefore I divide 35 × 24 by 54 and get 15 lb. 10 oz. *Ans.*

Note: It would be as well to order 20 lb., cut to the right measure, to be sure of having sufficient.

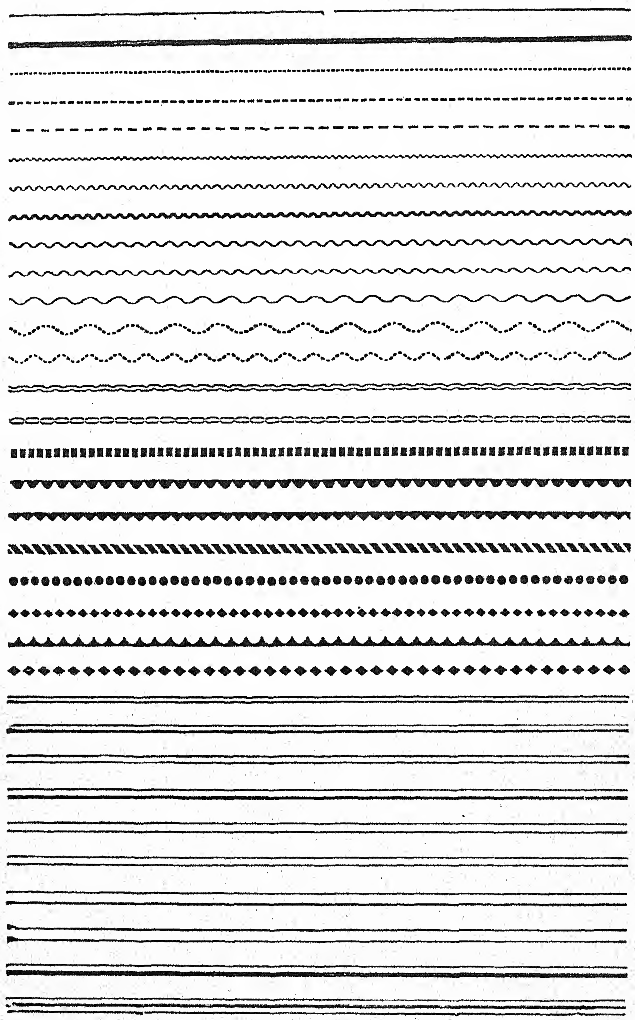


FIG. 33. PLAIN AND FANCY RULES.

Brass rules, fig. 33, are thin strips of rolled brass made type high usually in lengths of 18 and 24 inches, and in various thicknesses and patterns. In addition to the faces given, many other varieties can be had, and many combinations can be made by using two or more patterns together.

Column rules are sometimes made on large bodies, such as pica; this obviates the use of leads in forming the white on either side of the rule—an advantage in newspaper work. For short lengths the *special case*, fig. 34, is recommended.

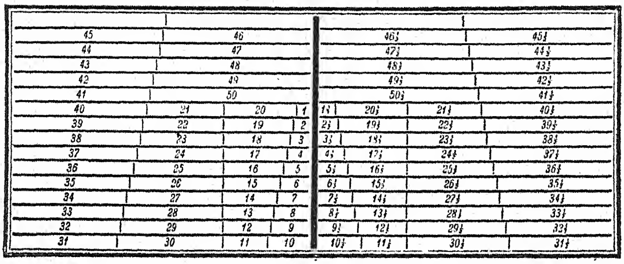


FIG. 34. BRASS RULE CASE.

Furniture and *reglet*, both wood and metal, are used for forming margins round the printed matter of a book, and to assist in bulking out the pages when imposed in the chase.

Wooden furniture is, perhaps, more generally used. It is made of well-seasoned oak, and supplied by the manufacturers in yard lengths, or cut to given measures which is "labour-saving." The term "furniture" is applied to that of the larger kind, from three ems thick and upwards. Reglet is made in various thicknesses, the same lengths as furniture, and generally equivalent to the bodies of types from Nonpareil up to Two-line Great Primer. Confusion is likely to arise if too many sizes are used, as the edges are sure to wear round quickly, and then it is a difficult matter to distinguish the thickness. The best for general use are

Nonpareil, Long Primer, Pica, Great Primer, Double Pica, Two-line English, and Two-line Great Primer.

For obtaining register, *i.e.*, accurately adjusting the position of pages, which are printed back to back, *scaleboard* is used, made of wood and of the same thicknesses as leads. Furniture is manufactured in three picas (technically called

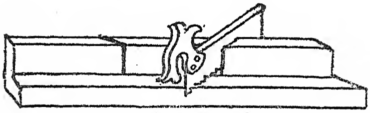


FIG. 35. SAW AND BLOCK.

narrow), four picas (broad), six picas (double narrow), seven picas (broad and narrow), and eight picas (double broad). Both reglet and furniture, if bought in yard lengths, are cut up as required by means of *saw* and *block*, fig. 35.

Great advantage is derived from using *metal furniture*, fig. 36. In addition to securing greater truth and solidity,

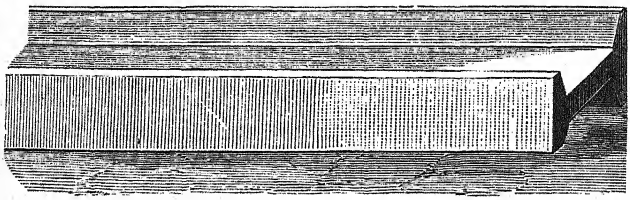


FIG. 36. METAL FURNITURE.

a considerable return is made for the old metal when broken or battered. It is, however, not advisable to use too much metal in any one forme; the introduction of a little wooden furniture here and there will serve to make the whole more binding. Metal furniture is generally made from a low grade of type-metal, but steel furniture has recently

been introduced. Its first cost, however, is somewhat greater, but the first outlay will repay itself in the long run.

All furniture which has become defective by wear and tear or warping should be discarded, because it is likely to give trouble in obtaining register, and also prevents the forme from being locked-up securely or squarely.

Foot- and *side-sticks*, fig. 37, are also classed under the general head of furniture. Wooden ones are usually made

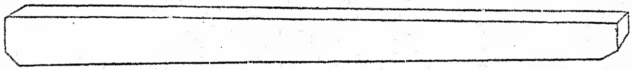


FIG. 37. FOOT- OR SIDE-STICK.

of oak, but sometimes metal is used, and then chiefly iron. These last are cast and planed on the side which is placed nearest the type, and made to sizes. Wooden ones are made in long lengths and cut down as required, the thin end being cut at an angle of say 45 degrees, and the extreme edges of the two outer ends just pared or chamfered to prevent the corners being split up. As seen in the diagram, one side only is sloped, to allow of the quoin, which has a corresponding slope on one side, being fastened squarely and tightly when locked-up.

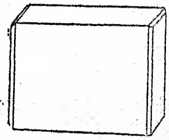


FIG. 38. QUOIN.

Quoins.—Those used for general work are made of wood—usually sycamore; they are sold by the thousand, and each bag contains an assortment of various sizes. These assortments are still further divided or classified respectively as jobbing, book, and news—the last-mentioned containing those of the larger kinds, whereas the others run smaller on the average. As explained before, one side of the quoin, fig. 38, is square, and the other sloped to correspond with the same angle of the side- or foot-stick, the corners being also

very slightly pared or chamfered. The shape may be likened to a one-sided wedge. Quoins are employed to "lock up" or fasten the pages in the chase, that it may lift as a "forme." To use two quoins together is wrong, because the two would practically form a square, so if it be requisite to fill out to the chase, one quoin and a piece of furniture should be used. See also figs. 84 and 85.

There are many mechanical appliances for locking-up on the market, and they are recommended especially for works of a regular size, but the prices of these improved systems

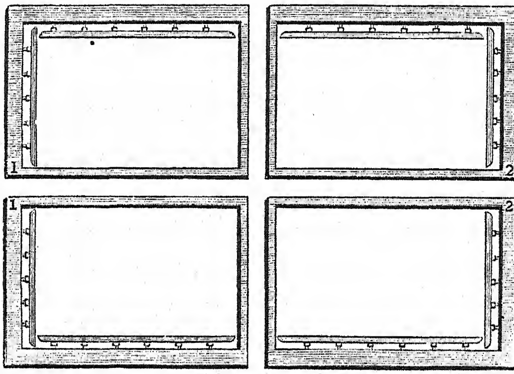


FIG. 39. SCREW CHASES.

are somewhat exclusive for general work. For news-work *screw chases* are very handy, and these are made in special sizes, each to hold a single news page, fig. 39. Threads tapped in the edge of the chase allow of screws being placed in and fastened up to the side- or foot-stick.

The *Marinoni* system, fig. 40, consists of a nut tightened up by means of a key; its application can be seen at a glance. *Ward's patent*, figs. 41 and 42, is of an entirely different kind, the fastening-up being obtained by the old method of mallet and shooting stick. The ordinary

metal side- or foot-stick is used, and the quoin is really

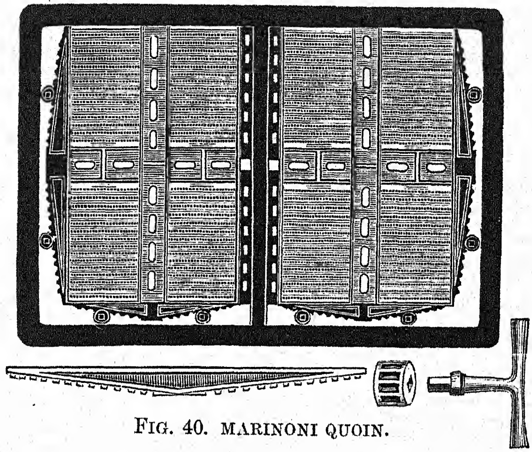


FIG. 40. MARINONI QUOIN.

another stick of similar length, but cast as it were like a

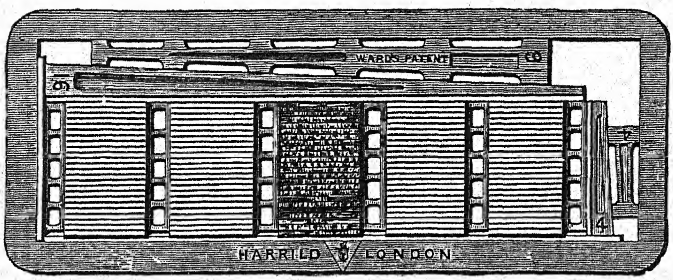


FIG. 41. WARD'S PATENT QUOIN AS USED.

FIG. 42. WARD'S PATENT QUOIN AND SIDE-STICK.

series of connected quoins. This plan gives a more equal pressure all along, but care should be exercised in first

starting the locking-up, or undue pressure may be given at the driving end. All these patented apparatus are made of iron. Another patent quoin is called the *Wickersham*, fig. 43, and is made of steel on the three-disk-cam principle. It is sold in two sizes, the smaller being in more general use; it is said to stand a pressure of 600 lb. It will be

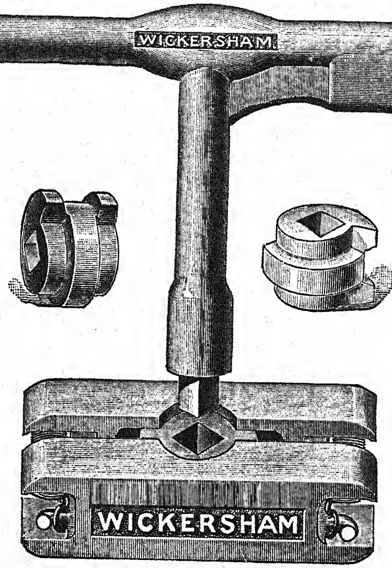


FIG. 43. WICKERSHAM QUOIN.

seen from the engraving that it is placed in between the furniture as an ordinary quoin, but, the two sides being parallel, no bevelled side-stick is required. A simple turn of the key is all that is requisite to fasten the forme.

As before said, for miscellaneous work the old-fashioned wooden quoin is still very useful, and it is an open question whether the formes are not really more secure with them if properly fitted and locked-up—provided the formes

are well looked after in hot weather, because wooden quoins are then apt to shrink.

For levelling and fastening up the type in chases sundry

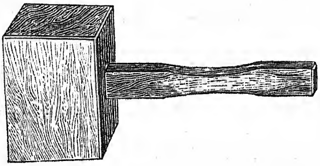


FIG. 44. MALLET.

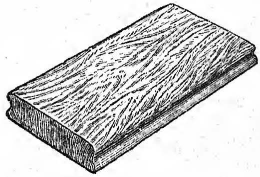


FIG. 45. PLANER.

tools are used, among them the *mallet*, fig. 44, and *planer*, fig. 45. *Shooting sticks*, fig. 46, or "shooters," as they are called for shortness, are of various kinds. We give a few

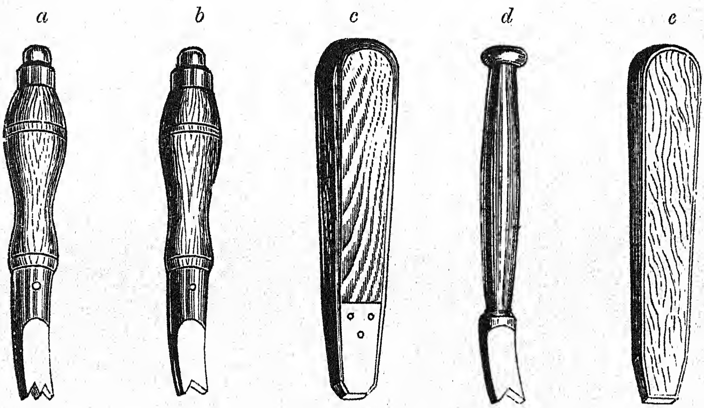


FIG. 46. VARIOUS SHOOTING STICKS.

varieties: *a*, *b*, and *c* are of boxwood with gun-metal tips, *d* is of iron entirely, and *e* is the original form of shooting stick, made of boxwood only. This last is the best for locking-up on the old imposing surfaces made of stone, as

metal tips are liable to chip the surface, but on iron surfaces the gun-metal tips would have no effect. The one lettered *d* is a very narrow one, being adapted for unlocking formes when the quoins are very small, but care must be exercised that the stick does not injure the surface.

Chases are rectangular frames used for placing round pages of type in imposing, and are made both in cast and in wrought iron; although dearer in the first place, the latter are much to be preferred, because the cast ones are likely to

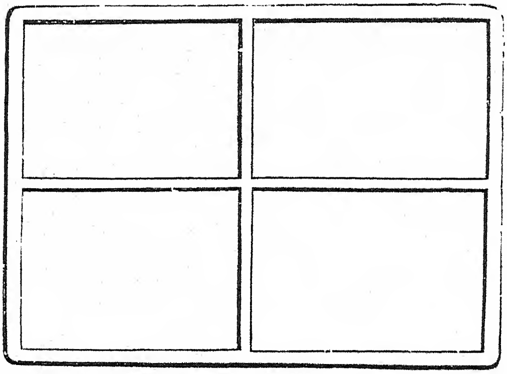


FIG. 47. CAST-IRON CHASE—FIXED BARS.

become cracked or broken in usage if not handled with care. Further, they are not always true, thus making the register or backing of pages in printing a difficult matter, and at the same time a difficulty always to be repeated whenever the chase is used. There are many varieties of chases, and these are classed roughly under three heads, as news, book, and jobbing. The first two kinds are not only made in single chases, but in double and quadruple sizes, so as to permit of their being placed close together on the machine in printing a large sheet. These chases are often divided

or subdivided into folio or quarto by means of cross-bars. In *cast-iron* chases, fig. 47, these bars are fixed, but in

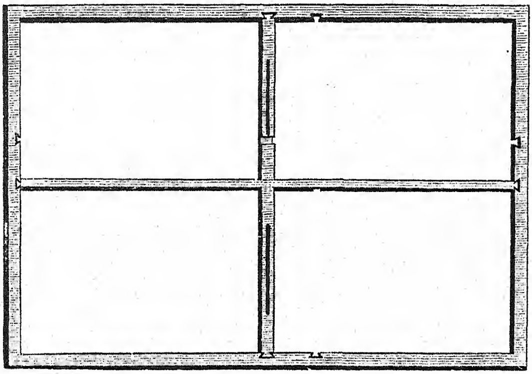


FIG. 48. WROUGHT-IRON CHASE—MOVABLE BARS.

wrought-iron, fig. 48, they are usually movable; thus, as

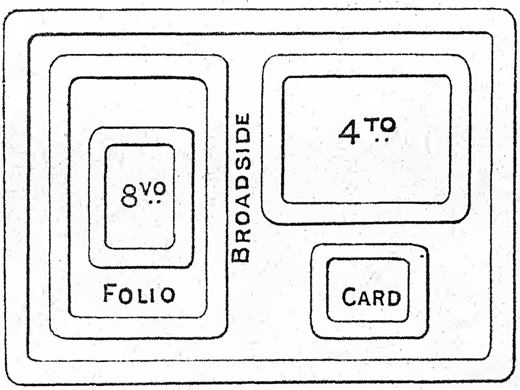


FIG. 49. JOBBING CHASES.

will be seen from the vacant slots on the inside, allowing of the chase being adapted for either twelvemo or eighteenmo.

Chases are mostly made to regular sizes, to suit the requirements of paper, *i.e.*, demy, royal, double foolscap, etc., with their respective double and quadruple equivalents, these larger sizes being in sections.

Jobbing chases are of many varieties, fig. 49, and differ greatly in sizes and shapes. They are used for broadsides, slips, or headings, cards, and jobs of all kinds.

The following, fig. 50, is a handy chase for locking-up small formes on press or machine. It is fitted with mov-

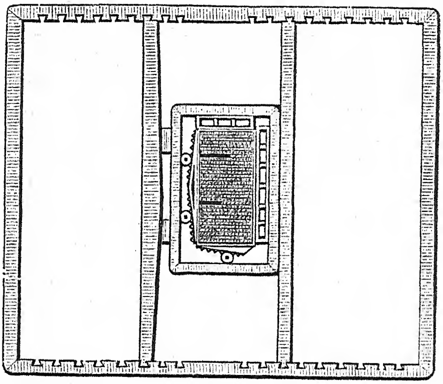


FIG. 50. LOCK-UP CHASE FOR JOBS.

able bars, which can be placed at different intervals according to the size of the job imposed in the smaller chase. This method obviates a quantity of furniture being used, and, further, is far more secure in fastening the forme to a given position.

Platen machine chases belong to the same class—the larger sizes sometimes having one or even two cross-bars in order to give rigidity to the forme, and at the same time obviating the tendency to "spring" in locking-up a large surface of type.

Imposing surfaces, fig. 51, or *stones*, as they are more often called, from the fact that these surfaces were originally made of stone, and sometimes marble or slate, are made of cast-iron slabs planed on the surface. These are mounted on strong wooden stands, bolted and screwed to give additional strength. They are made in several sizes, such as double or quad crown, or larger if required, having drawers placed underneath to hold quoins and furniture. Sometimes the spare space below is utilized for forme-racks or other receptacles, where space is an object.

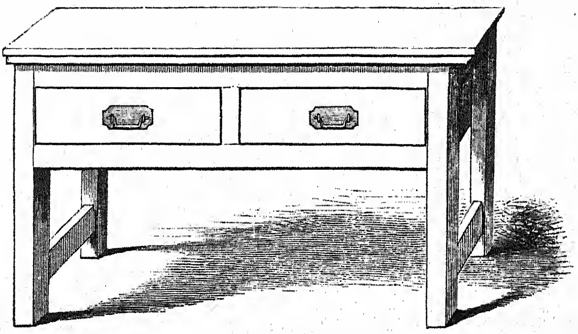


FIG. 51. IMPOSING SURFACE.

Forme-racks, fig. 52, are made, as a rule, distinct, and of different heights to take the standard sizes of chases. They are made of deal, with battens top and bottom to prevent the formes from rubbing or touching each other, thus forming a series of grooves; the space between the bottom battens is lined with hoop-iron—to allow the formes to be more easily pushed in and drawn out than they otherwise would be if not so lined. These racks can also be obtained of another kind, and we show the two systems as applied to holding various sizes of formes. The second is called the

"Universal" forme-rack, fig. 53, and is made of a number of inclined boards with grooves at the bottom lined with iron. In placing these racks it is advisable to select one that leans back from the direction in which the best light is given, as the face of the type would then be exposed to a

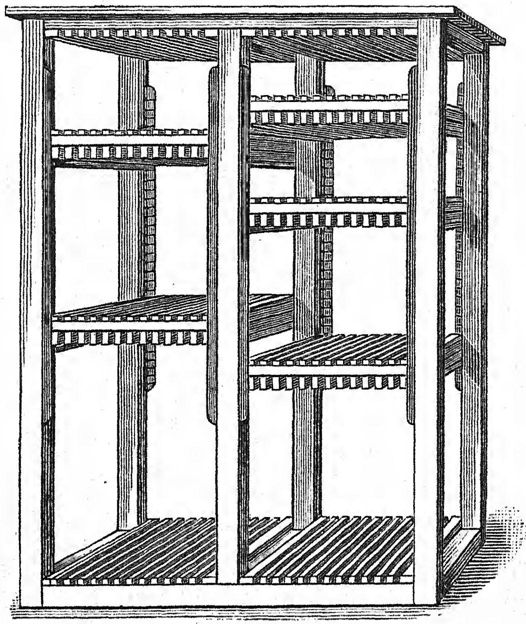


FIG. 52. FORME-RACK.

better view when searching for any particular forme. These receptacles are made in any size or length; if only one rack in height, the top can be used as a bench or bulk. Care must be used both in pushing in and taking out the formes from these racks, or the face of the type is likely to be rubbed against the inclined boards.

They can also be made in tiers as here shown, the

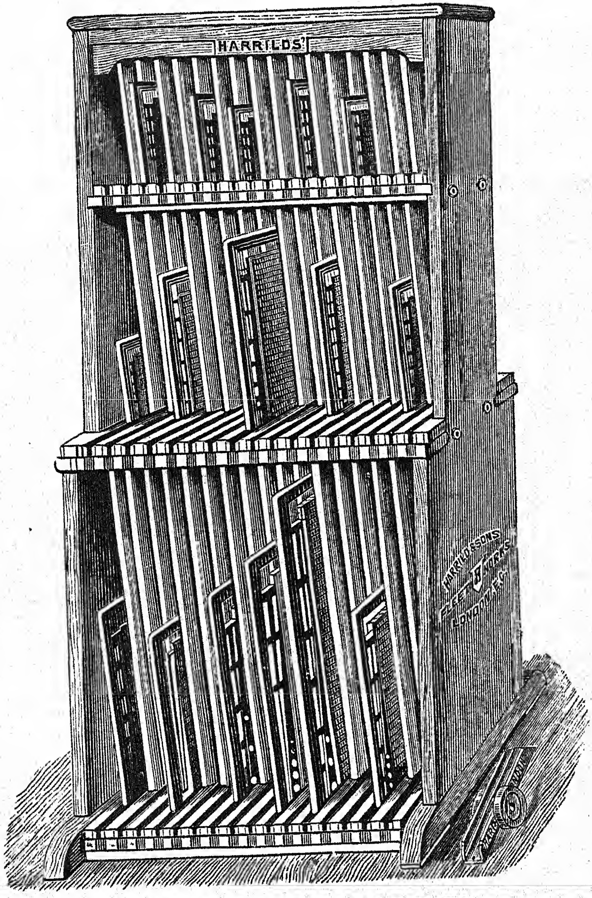


FIG. 53. UNIVERSAL FORME-RACK.

smaller size being topmost, so that it is possible to lift formes in or out without undue strain.

Bulks are movable boxes with the front open, having battens to form a *letter-board rack*, fig. 54. These are demy, royal, or double crown in width, and are generally placed at the end of the composing frames. The letter-boards contained in these racks are for holding matter for distribution, or for laying-up formes for the same purpose, the

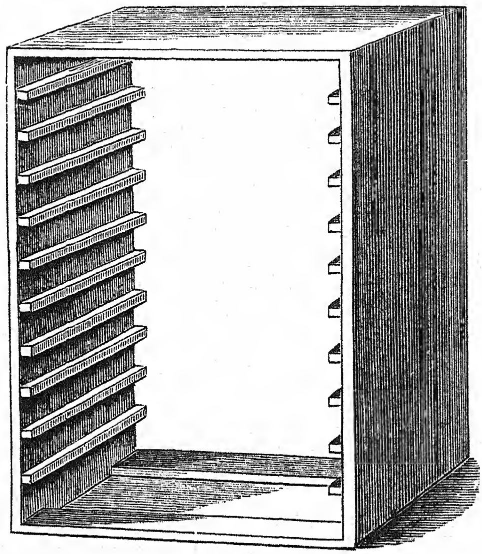


FIG. 54. BULK FOR LETTER-BOARDS.

top of the bulk being also utilized to place that board on which is immediately in use. Some composing frames have a small bulk attached to them in the shape of a single shelf with legs; this is useful for putting pages on as made-up, or superfluous sorts turned out of the cases.

Case-racks are also made apart from the frames. These are fixed in convenient places, usually holding fourteen pairs of cases in a rack six feet six inches high, and are for

the storing of cases not in immediate use. They are made single, or in pairs, or even in series, according to space at

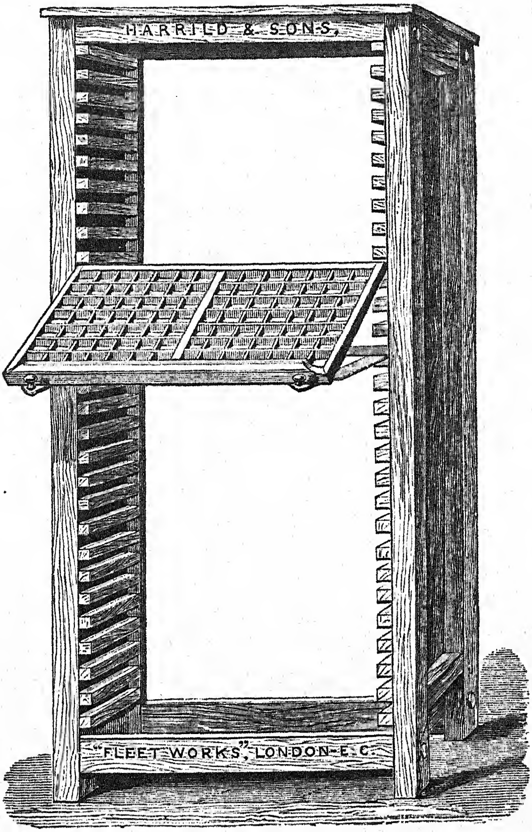


FIG. 55. CASE-RACK.

command. The illustration here given, fig. 55, shows a bracket arrangement for holding a case when only a line or two are required to be set, and is a useful addition. These

racks are sometimes made seven feet in height, and will hold sixteen pairs or thirty-two single cases. Tall case-racks are sometimes made on the dust-proof principle—that is, the cases fit absolutely close together, but this necessitates two metal handles to each in order to draw the cases out of the rack. This system, however, demands the use of composing frames made on the American principle, because these handles will not fit on the ordinary wooden frames.

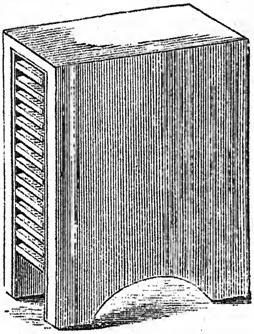


FIG. 56. GALLEY-RACK.

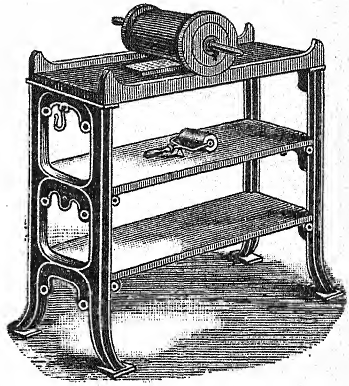


FIG. 57. CYLINDER GALLEY-PRESS.

Another receptacle is the *galley-rack*, fig. 56. These racks can be obtained singly to stand in any corner, or between two composing frames which back each other. For larger spaces they are made in rows or tiers as room will permit. Other arrangements are to be had for holding galleys, such as brackets or arms fastened to a wall.

In newspaper establishments, or those wherein work is executed which necessitates slip proofs, a *galley-press* is a necessary adjunct. There are two kinds of these to be obtained, viz., cylinder, fig. 57, and one on the platen principle.

They occupy a very small space, and require but little experience in manipulation.

Another proving press, or rather machine, is *Soldan's lightning proof press*, fig. 58, which has been in use during the past few years. As will be seen from the illustration, it is practically a small single cylinder machine, very compact

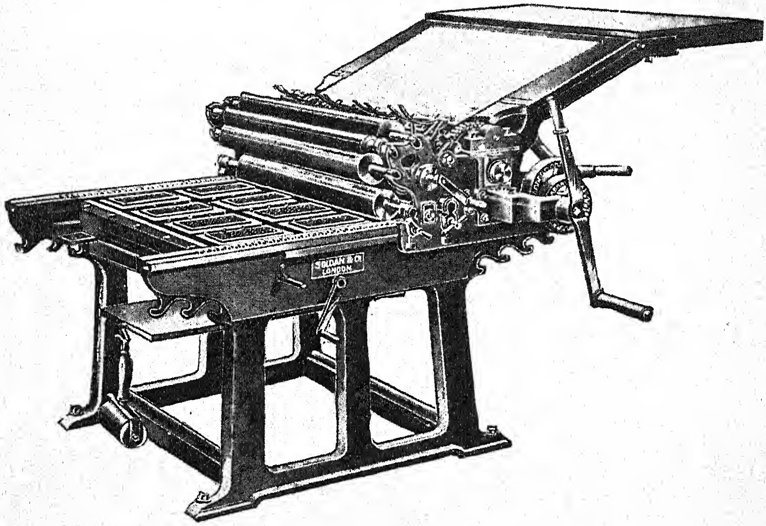


FIG. 58. SOLDAN'S LIGHTNING PROOF-PRESS.

and occupying little space, with an over-feed board and automatic inking complete. The press has two beds, the lower one fixed and the upper one movable. By means of wedges the upper bed can be raised or lowered so that either galleys or formes of plain type can be pulled. This alteration is accomplished by turning a small handle at the side of the machine. This is a useful press for

pulling special proofs or even for running off jobs of short number.

For cutting *brass rule* or *leads,* small machines are used.

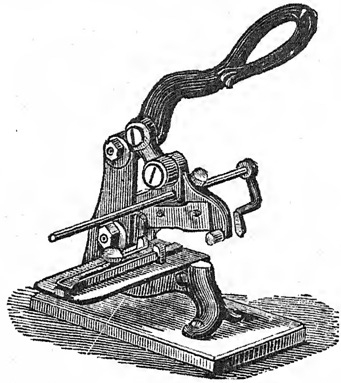


FIG. 59. CUTTING MACHINE FOR LEADS AND BRASS.

A good serviceable one is the old-fashioned cutter, but that with a lever arrangement, fig. 59, is an improvement.

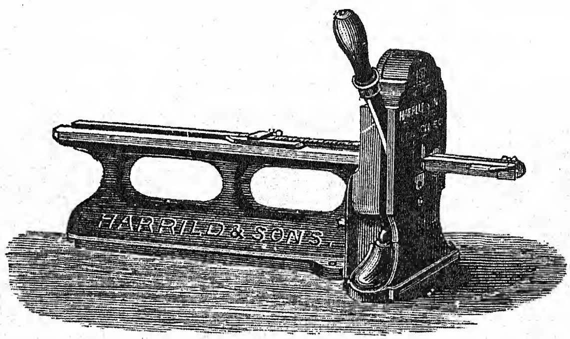


FIG. 60. BOWRA CUTTING MACHINE.

Another form is very compact, having a spring handle, fig. 60, with a guide to the right indicating the length being cut off. This machine is termed the "Bowra."

Page-cord, used for tying-up pages or portions of type, is a net twine. Ordinary twine will not stand water, therefore the proper kind must be obtained. Its application facilitates the lifting of matter from the galley to the imposing surface.

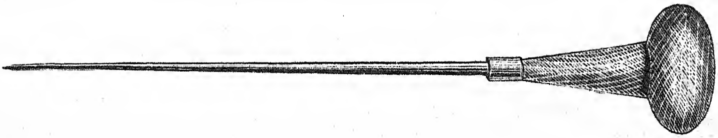


FIG. 61. BODKIN.

FIG. 62. TWEEZERS.

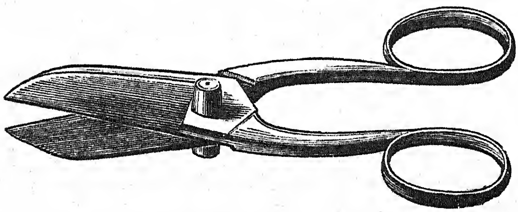


FIG. 63. SHEARS.

A few other implements complete for the present the general outfit of a composing room. Among these are a *bodkin*, fig. 61, and *tweezers*, fig. 62; the former for correcting ordinary matter, and the latter especially useful in table-work for lifting figures out of columns. A pair of *shears*, fig. 63, is sometimes necessary for cutting odd pieces of either lead or brass rule. Other articles in use will be referred to as required.

CHAPTER III

Position and Aspects of a Composing Room, with Plan—Learning the Boxes—Lays of Book and News Cases—Reversed Print—Attitude in Composing—Spacing and Justifying—Composition—Making Measures—Rules for Spacing—Emptying the Stick—Punctuation, Capitalization, and Indentations—Chapter Heads.

HAVING now gained some insight into the general aspects of the composing department, as well as the materials, tools, and other appliances used therein, it is necessary for the student to acquire a knowledge of the boxes of the upper and lower cases respectively.

It is absolutely necessary, in the first place, that a good light should be obtained for the composing frames, and, if possible, the light should be on the left of the operator as he stands at his case, but if the frames are placed back to back in order to economize room, it is only every other compositor who will obtain a left-hand light. For offices of a medium or large size, the best situation for a composing room is at the top of the building, on account of the better light; if the room is square with windows on both sides, the plan shown, fig. 64, is a good one. It may be mentioned here that during the past few years much improvement has been made in the planning out of printing houses in a general way, and some very fine offices have been erected, not only in London, but in the provinces too, light, ventilation, and sanitation having been especially studied, to the great advantage of the worker. Economy in space with labour-saving materials and plant should be made a feature in the equipment of all new offices.

Assuming, then, that the room is square or oblong, with ample light on either side, (A) would represent the frames placed back to back, two men (D) working shoulder to shoulder, but at opposite ends of the frames, in order to give each

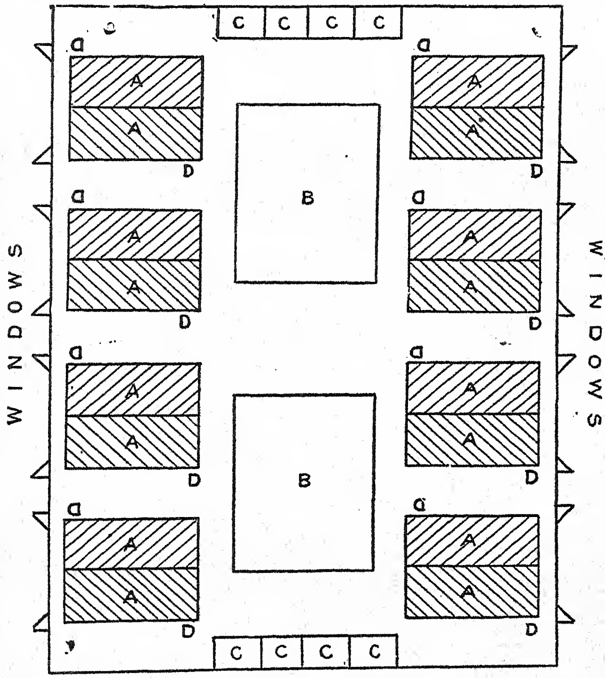


FIG. 64. PLAN OF COMPOSING ROOM.

other more room; (C) represents the tall case-racks, holding cases not in use; the imposing or correcting surfaces (B) are placed in the middle of the room. The other openings or spaces would allow sufficient room to move about freely. Unfortunately, such a good situation cannot always be procured, and other arrangements have to be made according

to circumstances. By all means keep the composing rooms quite distinct from the other departments, as the noise or bustle of any one department is disturbing to another.

A	B	C	D	E	F	G	A	B	C	D	E	F	G
H	I	K	L	M	N	O	H	I	K	L	M	N	O
P	Q	R	S	T	V	W	P	Q	R	S	T	V	W
X	Y	Z	Æ	Œ	U	J	X	Y	Z	Æ	Œ	U	J
1	2	3	4	5	6	7	â	ê	î	ô	û	§	‡
8	9	0	£	/	—	⁓	á	é	í	ó	ú	‖	†
ä	ë	ï	ö	ü	ç	k	à	è	ì	ò	ù	¶	*

Upper Case.

—	]	æ œ	) j	e	Thin and Mid. Spaces	ʼ ?	!	;	…	fl
& / ffl	b	c	d		i	s	f	g	… / …	ff / fi
ffi / Hair Space	l	m	n	h	o	y p	,	w	En Quadrats	Em Quadrats
z / x	v	u	t	Thick Spaces	a	r	q / .	: / -	Quadrats	

Lower Case.

FIG. 65. PLAN OF BOOK CASES.

We now return to the subject of learning the boxes. There are several systems in use, and we give two methods. Fig. 65 shows the plan generally used for laying the letters for bookwork. News hands adopt a different lay, and that

shown in fig. 66 is the one used by some of the leading London daily papers. This system no doubt facilitates the composition of news-work.

á	é	í	ó	ú	ç	*	A	B	C	D	E	F	G
à	è	ì	ò	ù	~	†	H	I	K	L	M	N	O
â ä	ê ë	î ï	ô ö	û ü	—	‡	P	Q	R	S	T	V	W
X	Y	Z	Æ	Œ	U	J	X	Y	Z	Æ	Œ	U	J
1	2	3	4	5	6	7	A	B	C	D	E	F	G
8	9	0	$	...	⅞	£	H	I	K	L	M	N	O
¼	½	¾	⅛	⅜	⅝	k	P	Q	R	S	T	V	W

Upper Case.

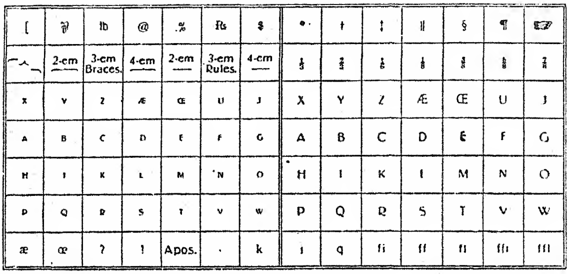
—	]	æ	œ	)	j		Thin and Mid. Spaces	'	?	!	;	...	fl
&	b	c		d		e	i	s		f	g	...	ff
ffl												...	fi
Hair Space	l	m		n		h	o	y	p	,	w	En Quadrats	Em Quadrats
ffi													
z	v	u		t		Thick Spaces	a	r		q	:	Quadrats	
x										.	-		

Lower Case.

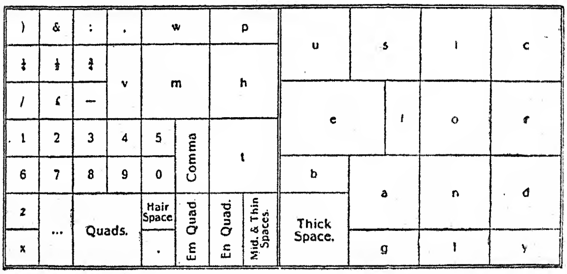
FIG. 66. PLAN OF NEWS CASES.

On page 74 we show the new registered lay, fig. 67, as issued and made by Messrs. Caslon and Co., Ltd., which is a distinct departure from the orthodox plan of cases. The boxes of the lower case in more constant use are brought to

the right hand of the compositor, which saves a deal of unnecessary travelling of the hand in passing from one end of the case to the other. Another point is that the spaces more generally in use are grouped together just under the



Upper Case.



Lower Case.

FIG. 67. THE NEW LAY.

operator's hand, thus facilitating or expediting the justification of lines.

The same remarks, in a measure, apply to the lay of the upper case, and it is claimed that the new lay is a distinct saving of time in the composition of ordinary bookwork, and still greater results are to be obtained in work of a tabulated kind, because the figures are placed in a much more

accessible position in the lower case, and only the less used lower-case letters relegated to the upper case.

For Greek, Hebrew, and some other languages cases of special make and complicated nature as regards the lay are required; these will be referred to in their order.

Having learned the boxes, it is advisable that the learner should have some experience in setting-up before attempting distribution. There are certain letters which are rather puzzling at first glance to the novice, and he has literally to mind his p's and q's, and also his b's and d's, in his first attempts at composition. In order to print correctly when impressed, the faces of the types are reversed in the

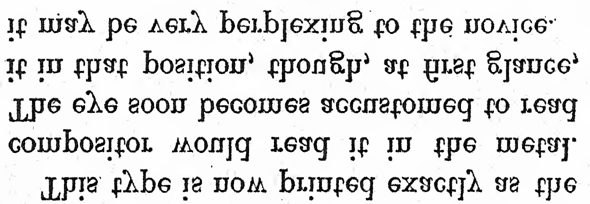


FIG. 68. WORDS AS READ IN THE METAL.

metal; therefore the practised compositor is accustomed to read the type backwards and upside down. This, of course, is due to the manner in which it is set in the stick, the nicks being placed uppermost. The reversed print, fig. 68, illustrates the first difficulty, which is, however, soon overcome.

There are a few elementary rules to be impressed on the learner. The most important is that he should acquire a correct and easy attitude in composing. If this is neglected at first, bad habits will grow, and then become no easy matter to shake off. Let the operator choose a standing position; a seat should not be allowed except in the case of physical inability to stand for any length of time, and, if this is necessary, a sitting posture should

be adopted for distribution rather than composing. If a stool is requisite, one with a single leg is best, because it allows more freedom, and the body will move or turn more easily. As before mentioned, the frame should be breast-high, so as to bring the lower case to a level with the elbow, as this is the most comfortable height at which to compose. In the case of a short lad, a platform or stool must be used to bring the arms up to the required level. If the person is above the average height, the cases can be made sufficiently high by putting one or even two pairs of cases under that in use. The body should have little or no swing in it; still, total rigidity is to be avoided. In picking each letter up separately, the hand holding the composing stick should be advanced a little to meet it. No false or unnecessary movement should be made in picking up or conveying the letters to the stick; the left thumb should touch the letter when placed in the stick by the right hand, each separate type being allowed to fall into the stick with a very gentle click. We have at times seen compositors make a very laboured action in picking-up—throwing the arms about, and, in dropping the letter into the stick, quite stutter or stammer, as it were, over that very simple operation. Be sure, then, that a graceful and easy method is acquired in starting, and all will be well in the end. The centre of the case, where the cross-bar is, should be the correct place to stand. In order to avoid the character of being slovenly, always read the lines as composed. This should be done as soon as they are finished and before spacing out; in time the habit will become so fixed, that in spacing out, or even in composing the line, the eye will wander over the words, and detect any letterals. Sometimes a quick type-setter who does not read his lines as advised will, when a week's work is done, be behind the more painstaking man who does, even though the latter may be slower in composing.

Spacing and justifying are two very important factors in good composition. When not executed correctly, the former is offensive to the eye which can appreciate careful and even spacing, and the latter increases the risk of the forme falling out if not properly justified. Spaces are so graduated that no excuse can possibly be made for bad and unequal spacing; nothing mars the appearance of a prose work so much as a want of uniformity in this respect. Bearing in mind the respective relations of the different spaces to their own body—*thin* (five to em), *middling* (four to em), *thick* (three to em), and *en quadrats* (two to em)—the spacing can be so finely graduated (more or less) as to be really imperceptible to sight when printed. For very particular works the spacing may be humoured to a certain extent. For instance, two words ending and commencing with either descending or ascending letters would require a little more space between them than two words ending and commencing with short letters, as in:

a	*b*
bad boy	nice child

These two pairs of words having precisely the same space between them illustrate what we mean: that *a* would take more space than *b* if the spacing is to be equalized so closely. Then, again, letters with a kern, as the lower-case f, would certainly take more, whereas after a comma the space could, if necessary, be slightly reduced. Unless a work is exceptionally well leaded, the thick or three-to-em space is considered the average, and it is this which the compositor uses when setting-up. Poetry works, with the exception mentioned, always have this space between each two words, the end of the line being filled up with quadrats and justified with spaces. In prose works, the same space is used, and if at the end of a line something must be done in

order to fill it up, the circumstance of its being a solid or a leaded work should be considered. For solid or unleaded works, or even those with a thin lead, adopt a closer space, and for leaded works select a wider, if any choice is given at the end of a line, supposing that it falls short of the measure. Taking a thick space as our standard, the following will give the spaces for getting in or driving out a line:

For increasing—	*For decreasing—*
Thin and middling,	Middling space,
En quadrat,	Thin space,
Thick space and middling,	Hair space
Two thick spaces.	(as a last resource).

Justifying a line should be performed by spacing each line out with equal tightness, but not to such a degree as to prevent the stick being emptied easily. Good justification, so as to allow a handful or page of type being lifted without dropping a single letter, is evidence of the careful workman.

Let the learner now place himself at the frame and take the composing stick, which has been made up to the required measure, in the left hand. It should be laid loosely in the palm of the hand, the thumb touching the brass setting rule placed against the bottom of the stick.

Measures are determined by pica ems, and usually placed in the stick thus—

em em em em em em em em em em em em em em em em em em em em

It is a bad plan to make up these measures to pica quadrats or leads of the length desired. One particular fount of pica should be selected for making measures for all in the same establishment, to obviate any variation of body. An odd en quadrat is sometimes used for narrow or half-measures in bookwork, but only when the full measure demands it.

In commencing to set type, a few words of the copy lying on the upper case in front of the operator should be

committed to memory. Assuming that a fresh paragraph is begun, an em quadrat is first placed in the stick to form the required indentation. He should then take a capital letter for the commencement of the word, placing it nick uppermost in the stick, the left thumb receiving it from the right hand and gently letting it slide into its position, fig. 69, these actions being repeated till the word is completed and a space inserted from the thick space box. In placing spaces in the stick, they may be put in regardless of the nick, as also quadrats; but the habit is so firmly acquired that one generally puts the nicks uppermost, uniform with the letters. In picking each separate letter out of the case, the compositor should fix his eye on some one of his letters, observing which way the nick is, and in conveying it to the stick dexterously turn it to its proper position before it arrives there. Probably at the start he will seize the first letter that comes to his fingers, and look at it, turning it to the required side before he drops it in the stick. In course of time he will be enabled to "spot" his letter as it lies in the case, and thus expedite the setting. When the first word is completed, and space inserted, the same process has to be gone through till the line is finished. The copy, of course, is read off as required, and the time occupied in picking up the space is a favourable opportunity for doing this. At the end of the line, supposing it is not filled out and there is not sufficient room for the next word, the rule laid down as to reducing or increasing the spacing according to the solid or leaded character of the work must be considered. Dividing words by means of the hyphen should not often

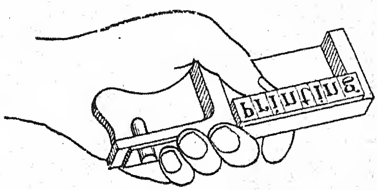


FIG. 69. SETTING TYPE.

be resorted to if the line can be fairly spaced without having too much or too little between the words. In wide measures, supposing the type is not a very large one, there should be no excuse for dividing words; where necessary to do so in narrower measures, if possible, do not break words in two following lines. It is also bad to divide a word at the end of the last line on any one page. When the line has been spaced and justified, put the lead in, if the work be leaded, and lift the setting rule out, placing it in front again preparatory to setting another line.

Certain extra spaces are required after the double points, to give, as it were, emphasis to the value of these punctuation marks; thus, an en quadrat should be placed after a semicolon (;), note of admiration (!), note of interrogation (?), and colon (:)—these points should have a thin space in front of them if they are cast on a thin shank, but a hair space only if there is a slight beard on the inside, and no space at all if there is an extra large beard; also, if the spacing of the line has to be altered more or less, the spaces after, but not in front of, these points should be altered too, proportionately. Commas and full points (as full stops or periods are called) should be placed quite close up to the last letter of the word. An em quadrat is placed after a full point in a run-on sentence. The last line of a paragraph, if a short one, is spaced out with quadrats. Commas should only have the usual thick space after them. Parentheses () and brackets [] are usually placed close up at either end, and the second (or closing) one is formed by simply turning it round—the nick to the back. Inverted commas (“), used for quotations, are made, as the term implies, by reversing two commas, placing a thin space after them; the marks used at the end of a quotation are formed by two apostrophes ("), usually without any space before them if preceded by a comma or a full point; in other cases they require a thin space.

When the stick has been filled line by line it must be emptied. This is a difficulty to the novice, and it is best that he should practise with a half-filled stick for a while. To execute this properly the stick should be placed crosswise on the case, head upwards, and the top grasped by the forefingers of each hand and the bottom by each thumb—the remaining fingers can then help to clasp the sides, thus holding the whole together. If the matter has not been too tightly justified it can be lifted out easily, fig. 70, and carried in that position, face outwards, and nicks downwards, to the galley on which it is to be emptied. When this has been done successfully several times a full stick may be tried. In all instances the setting rule should be used to give additional support to the handful; this is, of course, actually necessary in absolutely solid type, that is, set without leads.

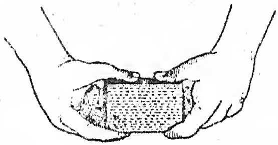


FIG. 70. EMPTYING THE STICK.

The reading of each line must be borne in mind before spacing out, and certain other rules are to be followed in good composition. These are the styles and customs of the house. In well-ordered establishments it is best that a few brief regulations should be drawn up and printed for the benefit and guidance of the case department. Different offices have their own methods for the capitalization of words, spellings, and other matters, therefore only general rules can be laid down here. Of course, all proper names should be commenced with a capital, and it is a good plan also to adopt the same rule for any direct reference to the State, Church, and words used in relation to the Deity, such as He, Him, His, Me, Mine, My, Thine, Thou, Thy. Other details should be determined by the custom of the office. We give in Chapter XV a few hints which may be taken as a basis for formulating some sets of rules to govern both

compositors and readers, and which, if adopted, will obviate much friction between those departments, and be for the reputation of the establishment.

Wide measures of bookwork take $1\frac{1}{2}$ or even 2 ems indentation of their own body, and in the case of the first paragraph of a fresh chapter or section the first word is generally set in CAPITALS and SMALL CAPITALS, and when this is so, it is set full out to the measure without indentation. In manuscript copy the usual signs to indicate capitals, small capitals, and italic are:

CAPITALS	= *three* underlinings	
SMALL CAPITALS	= *two* ,,	
Italic	= *one* underlining	

In spacing out poetry or short lines with quadrats, always place the quadrats at the end of the measure, and any spaces requisite to justify the line should be placed between the first and second, if more than one quadrat is used. This plan prevents the spaces from falling down in the event of their being placed next to the last word, should it be necessary to lift that word out for correction; if only one quadrat is needed, place the space, if any, immediately after the last word and before the quadrat.

Manuscript copy requires far more judgement in composing, owing to the way it is usually written. Most authors and writers ignore punctuation and use capitals too freely; it is, therefore, the duty of the compositor to point his matter as he proceeds, and, in the absence of special instructions to the contrary, to follow the rules of the house as regards capitals and other details. For this purpose an extra price is provided in the scale of charges—a halfpenny per thousand ens being considered the equivalent value, but in our estimation it is often insufficient for the average class of manuscript copy supplied. Reprint works generally have to be followed literally save for obvious errors.

Cross-lines or chapter heads set in capitals or small capitals should be justified in the centre of the measure by putting equivalent quadrats and spaces at either end of the line; if the matter of a thin space is left to be divided at the last, put the extra space in the first part of the line; this will help to counterbalance the comma or full point that may be placed at the other end, as these punctuation marks, in a large type especially, usually appear to throw the line out of the centre.

We have now shown the method of setting-up for ordinary straightforward bookwork. With the help of the remarks on spacing, justifying, and emptying the stick, the learner may proceed till the type in his case has been exhausted. But it is very necessary not to forget the advice given as regards position and movement in composing, and we repeat it. Avoid all unnecessary movements in picking-up, and drop the letters in the stick deliberately but quietly. Experience will soon teach the nearest and best way to the boxes, and back again to the composing stick. Bad habits and ungraceful movements are easily acquired but difficult to discard, therefore it is of the greatest importance that a free and not formal manner should be acquired. The wrist must be used as much as possible, and the elbows kept square, and at the same time the body should have little or no movement. All feints in picking up the letter or flourishes with the arm must be avoided, and the left hand containing the stick should be moved a little in the direction of the other hand to meet it, as it were, but care should be taken that it is not stretched too far, or it will counteract the advantage which might otherwise be gained.

CHAPTER IV

Preparing Type for Distribution—Method of Distribution—Odd Sorts and Peculiars—The Jigger—The Sticking or Caking together of Type.

THE letter—as type is called sometimes in a collective sense—having been all set up, the operator may now proceed to learn something of *distribution.* He will have acquired a good knowledge of the boxes by this time, and will be able to drop the different letters into their respective boxes with a far greater degree of certainty than if he attempted this part of the work in the first instance. It is marvellous to observe the rapidity with which a practised compositor distributes the type into his case; this being only attained by long practice. Clean matter and proofs being desired, much depends on proper and correct distribution, therefore it is necessary to cultivate a very careful manner in distributing, and too much haste by a beginner should be deprecated.

Distribution is a term applied both to the matter itself as a whole and to the act of distributing the same. The type may be obtained from the store-room, or from formes of the work in hand—technically called "its own"—or those of a similar nature in the same fount. Under any circumstances, the compositor should see that the type is quite clean, and if not, he must wash it. Assuming he has to take a forme of type for his distribution, and it requires washing, it should be placed on a board, washed over with

lye, and rinsed with cold water; then the forme should be unlocked and receive a second rinsing, by which the water will run between the lines and spaces, thus rendering the whole more convenient for the separation of the letters, which would not be so easy if manipulated in a dry condition. This last wetting is perhaps better done with a sponge usually kept for the purpose. Though this treatment assists the distribution by making the letters separate more freely, it at the same time, curiously enough, has the effect of binding the whole matter together when handled in bulk. Take, for instance, a page left standing naked on the imposing surface or board—that is, stripped of its surrounding furniture. If dry, the letters on the outside edges of the page would most probably fall over on their sides, but if wetted they would keep their position whilst any moisture was retained. In fact, if a forme has to be re-imposed or re-arranged on the stone, it is always best to damp the edges slightly with a sponge. This prevents a possible accident to the type, which might be overlooked in the proof.

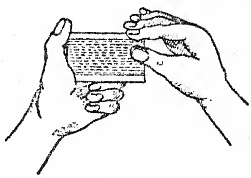


FIG. 71. DISTRIBUTING.

To commence, the operator would take a handful of matter, say about a stickful in depth, taking care that the bottom line has either a lead or setting rule against it to prevent breaking or "pieing"—"pie" being a technical term for "broken" or mixed type. The piece should be lifted with both hands and placed, nicks uppermost, in the hollow of the left hand, the type lodging on the three fingers, and the forefinger grasping it round the back; the thumb would then steady the left side of the handful, fig. 71. The right hand is thus free to commence. With the second finger of this hand push the first word of the right-hand end of the line up, then seize it also with the forefinger and thumb.

The word is now grasped between the thumb and the first two fingers of the right hand; as this is done, the word should be read, and each letter dropped singly into its own box. The separation of the letters is easy, and it will be found, when the word is held in the fingers as described, that a little pressure or squeeze of the fingers, especially with the second finger, will serve to divide each segment of the word. When the word is all put into the case, repeat the action till the case is filled. In time the learner will become quite expert, and able to take two or three words at a time, according to the size of type in use—the

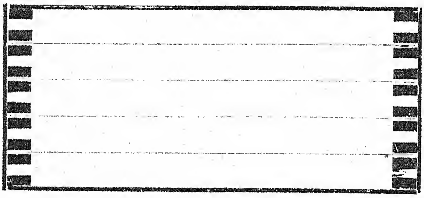


FIG. 72. JIGGER FOR ODD SORTS.

smaller the better, provided it is not too minute. Carefully discriminate between the spaces, and throw them into the proper receptacles, because it will save much time afterwards in composing. The average speed for distribution is from three to four times that of composing.

Odd sorts and peculiars, which have no place in the cases in use, as likewise occasional words of italic, should be put aside for after-distribution into their proper cases.

A handy article to hold these sorts temporarily is a *jigger*, made of quadrats and leads combined, a piece of stout paper being wrapped round the back to form a bottom, and the whole being tied round with page-cord. The accompanying diagram, fig. 72, will give some idea of what we mean. Wooden boxes on the same principle can be obtained of the material manufacturers. It is a slovenly plan to allow

these sorts—often valuable—to accumulate, and possibly be thrown in the back or unused boxes of the upper case. They create there a mass of pie, and cannot be found when wanted. The quadrat box should also be kept scrupulously free from all extraneous sorts or spaces.

Another consideration of type for distribution is that new founts, or type laid by out of use for a long period, is apt to become stuck together, "caked" or "baked." There are certain remedies to counteract this evil, for it is assuredly one, as those who have experienced it will testify. If distribution is attempted under those conditions, the type will probably cut the fingers if it is new, and, if old, at least will make them very sore and unfit for composing. Hot lye is sometimes used to wash the type over to assist the separation; glycerine also may be tried with good results. Another remedy, if the type is not very much caked, is to have the steam-cock of the boiler turned on to the face of it.

CHAPTER V

Making-up into Pages—Different Styles of Headlines—Determining the Length of Page—Page Gauges—Footnotes, Sidenotes, and Cut-in notes, with their Reference Marks—Rules for the Setting of Preliminary and Appendix Matter—The Printer's Imprint—Tying-up Pages—Signatures.

TAKING bookwork as our standard for the moment, it will be seen that books are most frequently divided into chapters or sections. Sometimes these commence with a fresh page, and in such instances usually with a "dropped head"—that is, they will begin about one-third down the page. Sometimes, on the other hand, they are "run on," by which we mean that the new chapter or section commences on the same page, with a suitable amount of white or space between it and the end of the preceding chapter, provided the last chapter does not end very low down on the page. Whichever plan is adopted, uniformity is to be desired throughout as regards spacing and display of chapter heads.

Headlines of the pages are set in various styles. Pamphlets may perhaps have a plain folio only, but works, *i.e.*, longer books, will have a headline which may be dependent on instructions. Italic capitals, italic lower-case, roman capitals, and small capitals are all used in turn, and sometimes with a rule under. Further, the subject-matter of the headline is often determined by the nature of the work. Some volumes have the fixed left-hand headline bearing the name of the

volume, and the right-hand one containing the subject of the chapter. The amount of white or leading after the head-line, too, is regulated by the style adopted, and the solid or leaded character of the work.

The length of a page depends of course on the width of matter, and the size of paper to be used. Roughly speaking, to form appropriate margins to a page, there should be a trifle more margin on the top and bottom of a page than on the two sides (see pp. 105-110). Sidenotes, and runners down the sides of pages, are thrown into the margin entirely if the former are not very heavy. Footnotes are therefore preferable where possible, as full sidenotes do not improve the appearance of a page.

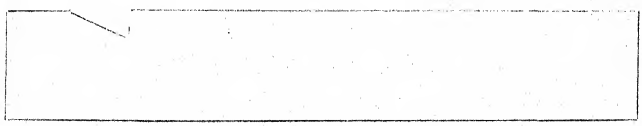


FIG. 73. PAGE-GAUGE.

The length of a page having been determined, a *gauge*, fig. 73, should be made to the size, a piece of pica reglet with a notch cut in it serving as the mark for length. Each page should have a white line of quadrats at the bottom—this line to be over and above the length determined on in making the limit of the page, but included in the gauge. This white line serves two purposes—first, it protects the last line of type, forming, as it were, a bulwark; secondly, it contains the signature of the sheet when required. It is also useful in certain exigences of making-up, such as having to make a page a line long, in which case the removal of the white line obviates the necessity of altering the furniture. When this occurs it is desirable to have the facing page, be it odd or even, equally long. In paging matter, never turn the break or end line of a paragraph over to the

top of the next page, and if possible do not commence a fresh paragraph—being indented—at the bottom line of a page.

Where *footnotes* are voluminous and numerous, much trouble is sometimes caused in putting the notes to their proper pages, especially if the references happen to fall near the bottom. Under these circumstances it is permissible to carry over a portion to the next page. Reference marks for notes are of three characters: the signs * † ‡ || § ¶ are used occasionally, and when further references are required on the same page, these are repeated, ** †† and so on. Superior figures [1 2 3] and letters [a b c] also are used, but more frequently the figures. *Sidenotes* as a general rule do not have references, as their parallel position indicates the reference Footnotes are nearly always set in type two sizes (or removes, as they are called) smaller than the text; if this is leaded, the notes should have a thinner lead. Sidenotes and *cut-in notes* are frequently put into type three or even four removes smaller.

With regard to the *preliminary* matter of a volume, avoid using fancy types in displaying, and set the title in good round types of the same character as the body of the work. Condensed type does not look well unless it is for an exceptionally long line which would suffer more in dividing. To be consistent and yet effective a title-page should be set up all in one kind of type. A mixture of several founts should not be tolerated in any circumstances. Contents pages, if not very full, should be set in capitals and small capitals, and the dedication neatly displayed in even small capitals, with the name of the person to whom the work is dedicated put in full capitals. Prefaces and introductions, if not long, should be set in type one size larger than text, but the old-fashioned way of putting them in italic looks well. If these parts of the preliminary matter are extensive, the text type may be used, with a

slightly thicker lead between the lines than that used in the book. If the text is solid, use only a thin lead. All these pages should be expressed by Roman numerals—not figures—in roman lower-case, commencing with the half or bastard title. Indexes are, as a rule, set in type two sizes smaller than text, in two columns, and the pagination continued on from the text. The style to be adopted in setting these depends on the nature of the index to be composed.

The printer's *imprint* should always appear at the end of the work, and might also be placed at the back of the title. By Act of Parliament (32 and 33 Vict., ch. 24) the printer

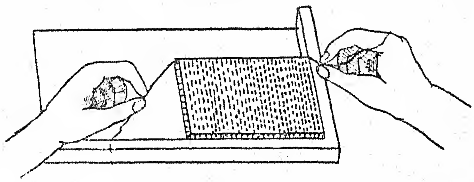


FIG. 74. TYING UP A PAGE.

is compelled, under a penalty, to affix his imprint to all books printed by him, and, in the event of an action at law, he may be non-suited if his imprint has been omitted.

Having considered these methods of composing the preliminary and appendix matter, we will follow the making-up or paging of the work. As the pages are completed they should be tied up with page-cord, fig. 74, this cord being sufficiently long to go round the page at least three times if the page is small—for a large one, four times or more to give additional security. Place the end of the cord a short distance beyond the left-hand top corner, and carry it to the right, drawing it tightly; when the whole page has been encircled once, and the overlapping portion at the corner crossed, pull the cord rather more tightly, first of all placing

the left hand on the face of the page to prevent it from springing on pulling the cord; when the end is reached, simply tuck it in with the bodkin, leaving the extreme end out in order that it may the more easily be untied. See that it is pushed down to the centre of the type, as the page may spring when lifted if the cord is not placed in the middle. After this is done, the pages may either be lifted to the imposing surface one by one, or, in the case of large pages, slid off the galley on to the surface by sharply drawing the galley from underneath, care being taken to keep the page as square as possible, otherwise the type will be sent off its feet, and be difficult to put right. When a sufficient quantity of pages have been made up—the size of the page of type and paper governing the number of pages to the sheet, *i.e.*, folio, quarto, octavo, sixteenmo, etc.—the imposition (see pp. 97-105) must be so arranged that the pages when printed shall fall correctly on the sheet when folded.

Each sheet should have a letter, called the *signature*, at the foot of the first page, so that the folder may readily identify the particular sheet; these signatures are usually set in small capitals, and serve as a means of identification by the printer. They should be in sequence except for certain omissions as indicated below. Put signature B on page 1 of the text; the preliminary matter, usually put into type after everything else, is distinguished as a rule by *italic* lower-case letters, *a b c d*, etc. The printer's alphabet usually consists of

B C D E F G H I K L M N O P Q R S T U X Y Z AA BB, etc.,

A or *a*, with the subsequent letters in italic lower-case, being reserved, as just remarked, for the preliminary matter. Some few printers put signature A on page 1 of the text, in a small capital, and the preliminary matter is signatured by the use of italic lower-case letters, commencing again with *a* and so on. It will be observed that the letters J V W

are omitted. Some printers use a second signature for the opposite corner of the sheet, *i.e.*, the third page; this is denoted by B 2, C 2, D 2, etc. In twelvemo and eighteenmo this is an actual necessity, and the insets should be marked with a signature answering to the one on the first page. For instance, sig. B in twelvemo half-sheet work should have B 2 on the fifth page.

If a work extends over three or more alphabets, express the second and other signatures thus, 2 A or 3 A, etc. It should be noted that these signatures are differentiated from the inset ones by the figures being placed in front of, and not after, the letter. If only spread over two alphabets the double letters may be used, AA, BB, CC, DD, etc.

CHAPTER VI

Imposition—Outer and Inner Formes—Definitions of Sizes of Books—Table of Signatures and Folios—Schemes of Imposition—Margins of Books—Making Margins—Type Measures or Scales—Furniture—The proper method of using Quoins—Furniture Gauges.

THE placing of the pages in their respective positions previous to working the sheet is called *imposing* them. The appended schemes of *imposition* will give all the varieties required for bookwork. But first a few technical terms must be explained. In sheet work there are two formes—the *outer* is the one containing the first page and the signature; the *inner* forme is the backing one, containing the second page. Sizes of books are determined by the number of times a sheet is folded, be it demy or any other size. A sheet folded once or in half is called *folio*; folded into four, *quarto*; into eight, *octavo*; twelve, *duodecimo* or *twelvemo*; sixteen, *sixteenmo*; eighteen, *octodecimo* or *eighteenmo*, and so on.

The methods employed for imposition after all are really simple, and only require a little forethought on the part of the student, by committing to memory a few very elementary rules which will help him much in laying the pages down in their correct order. For instance, the first page of any one section is always laid down at the near left-hand corner, the last page of the signature being placed next to it. Unless it be an insetted signature, such as a twelvemo or

eighteenmo, all other denominations, whether quarto, octavo, or sixteenmo, the two centre pages of the same section will always be head to head with the first and last pages just mentioned, thus forming a square four pages, so that when folded up to its given size those pages will fall correctly into their respective positions. A few other points are that certain impositions in half sheets are the same as in sheets; for instance, a sheet of folio is laid down as a half sheet of quarto, and again, sheets of quarto and octavo are laid down in the same way as half sheets of octavo and sixteenmo respectively, and so on. Further, that any forme is laid down incorrectly is often detected at a glance by the fact that the folios of any two pages next to each other may not be at the extreme or opposite corners of that section of two pages, because the folios of both left- and right-hand pages must always appear on the fore-edge of the volume.

Besides the set schemes of imposition given in the following pages there are many variations that will suggest themselves to the student upon reflection. On consideration he will soon find some other method of laying pages down to a given number helpful in dealing with certain exigences that do often arise in the imposition of bookwork, and this applies to jobbing work too in many instances. The great point is to test any proposed imposition by folding and cutting up a sheet of paper to the size and number of pages of the required section. A little practice will enable any one to dispense with reference to the formal schemes which by the uninitiated are frequently considered a difficulty—but this is more imaginary than real if any one is in earnest and desirous of learning for himself.

The annexed table of signatures and folios will be found useful for reference purposes, the folios being compiled for sheet work. In half-sheet work the number of pages here given must be halved, *e.g.*, signature R in octavo sheet work is p. 241, but in half-sheet octavo it should be p. 121.

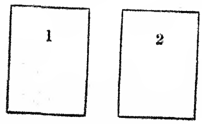
TABLE OF SIGNATURES AND FOLIOS.

No.	Sigs.	Folio.	4to.	8vo.	12mo.	16mo.	18mo.	24mo.
1	B	1	1	1	1	1	1	1
2	C	5	9	17	25	33	37	49
3	D	9	17	33	49	65	73	97
4	E	13	25	49	73	97	109	145
5	F	17	33	65	97	129	145	193
6	G	21	41	81	121	161	181	241
7	H	25	49	97	145	193	217	289
8	I	29	57	113	169	225	253	337
9	K	33	65	129	193	257	289	385
10	L	37	73	145	217	289	325	433
11	M	41	81	161	241	321	361	481
12	N	45	89	177	265	353	397	529
13	O	49	97	193	289	385	433	577
14	P	53	105	209	313	417	469	625
15	Q	57	113	225	337	449	505	673
16	R	61	121	241	361	481	541	721
17	S	65	129	257	385	513	577	769
18	T	69	137	273	409	545	613	817
19	U	73	145	289	433	577	649	865
20	X	77	153	305	457	609	685	913
21	Y	81	161	321	481	641	721	961
22	Z	85	169	337	505	673	757	1009
23	A A	89	177	353	529	705	793	1057
24	B B	93	185	369	553	737	829	1105
25	C C	97	193	385	577	769	865	1153
26	D D	101	201	401	601	801	901	1201
27	E E	105	209	417	625	833	937	1249
28	F F	109	217	433	649	865	973	1297
29	G G	113	225	449	673	897	1009	1345
30	H H	117	233	465	697	929	1045	1393
31	I I	121	241	481	721	961	1081	1441
32	K K	125	249	497	745	993	1117	1489
33	L L	129	257	513	769	1025	1153	1537
34	M M	133	265	529	793	1057	1189	1585
35	N N	137	273	545	817	1089	1225	1633
36	O O	141	281	561	841	1121	1261	1681

N.B. In this table signature B always commences with page 1, and the letters A, J, V, and W are not included.

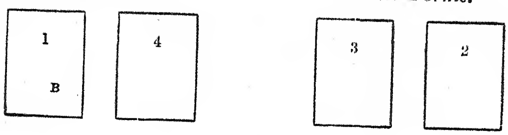
SCHEMES OF IMPOSITION

Half Sheet of Folio.

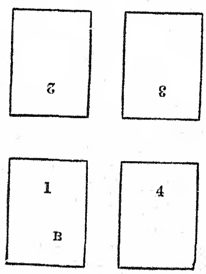


Sheet of Folio.

Outer Forme. *Inner Forme.*

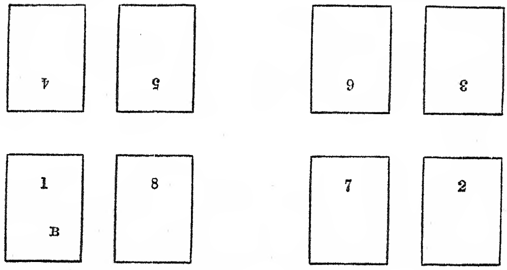


Half Sheet of Quarto.

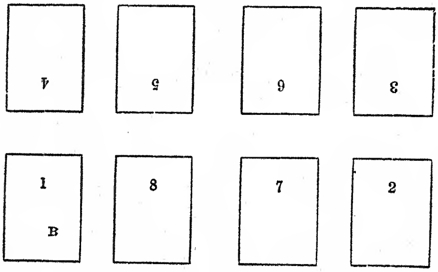


Sheet of Quarto.

Outer Forme. *Inner Forme.*

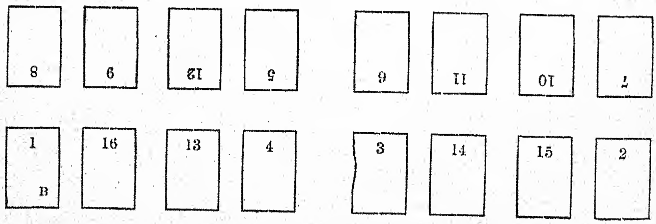


Half Sheet of Octavo.



Sheet of Octavo.

Outer Forme. *Inner Forme.*



Half Sheets of Twelves.

With offcut.

6	7	8	5 B2
4	9	10	3
1 B	12	11	2

To fold without cutting.

5	8	7	6
4	9	10	3
1 B	12	11	2

Sheet of Twelves (*with offcut and one signature*).

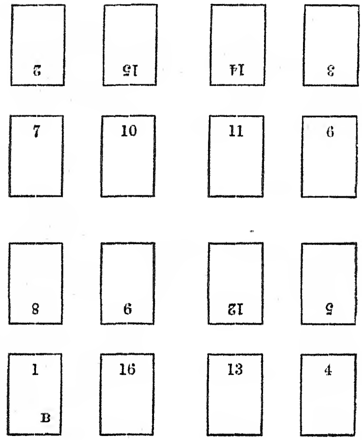
Outer Forme.

12	13	16	9 B2
8	17	20	5
1 B	24	21	4

Inner Forme.

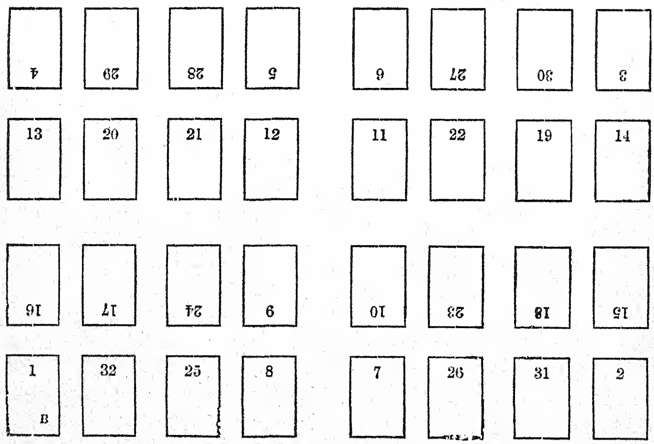
10	15	14	11
6	19	18	7
3	22	23	2

Half Sheet of Sixteens.

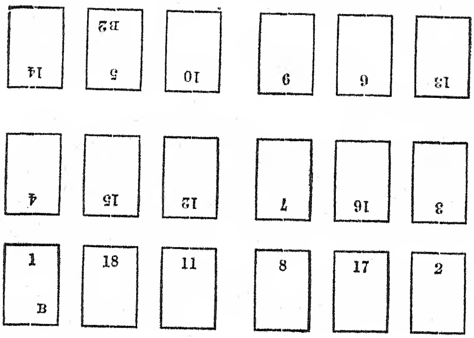


Sheet of Sixteens.

Outer Forme. *Inner Forme.*

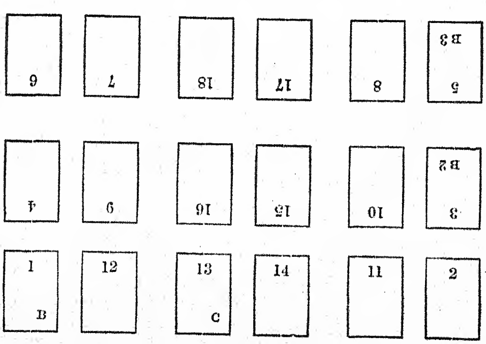


HALF SHEET OF EIGHTEENS (*with offcut, transposition, and one signature*).



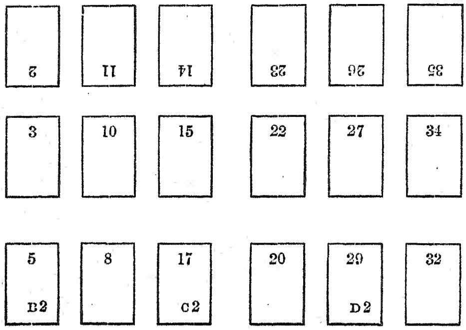
When one side of the paper is worked, the following transpositions must be made: pages 7 and 12 to take the places of 11 and 8; and 11 and 8 the places of 7 and 12 respectively.

HALF SHEET OF EIGHTEENS (*without transposition, with offcut and two signatures*).

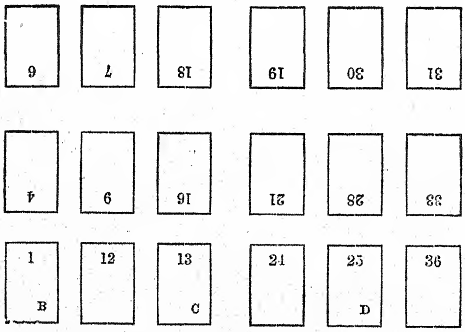


SHEET OF EIGHTEENS (*with offcut and three signatures*).

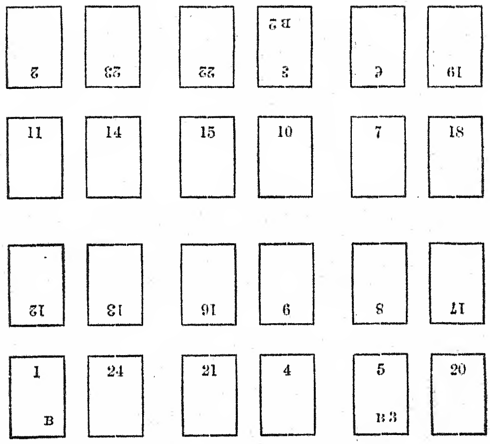
Inner Forme.



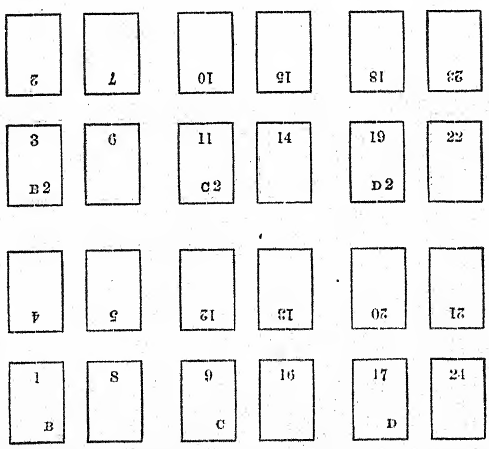
Outer Forme.



Half Sheet of Twenty-Fours (*without cutting*).



Half Sheet of Twenty-Fours (*with three signatures*).



Sheet of Twenty-Fours.

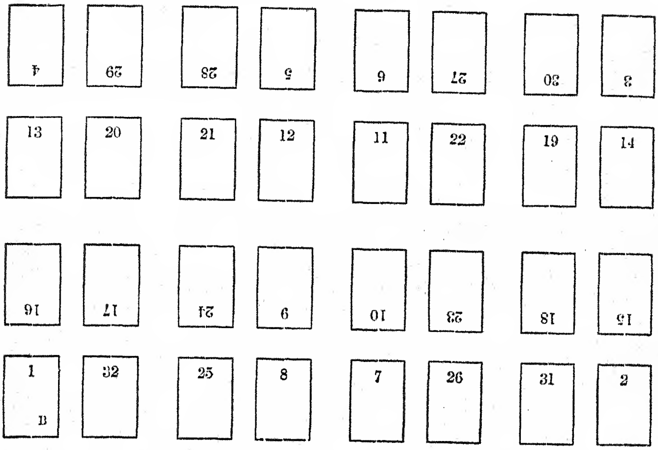
Inner Forme.

2	47	46	B 2 3	6	43
23	26	27	22	19	30
14	35	34	15	18	31
11	38	39	10	7	42

Outer Forme.

12	37	40	9	8	41
13	36	33	16	17	32
24	25	28	21	20	29
1 B	48	45	4	5 B 3	44

HALF SHEET OF THIRTY-TWOS.



Other impositions are required occasionally. These, we repeat, may be determined by folding a sheet of paper into the required number of leaves, and then marking with a pencil the pages in order. This should then be opened out; one side will give one half or side of the sheet, and the reverse side the other half. Of course the pages must be laid down in reversed order compared with the sheet so marked; then an impression from these pages of type would be the same as the folded sample.

Making of margins.—A chase or chases of a suitable size must be selected. In large formes it is requisite to have as many bars as possible, because they give additional security to the forme, and prevent the rising or springing of the type when locked-up. Some printers aim at centring the pages of printed matter on each leaf of paper, allowing a little on the outside edges for the cutting of the book by the binder afterwards, but this plan is

certainly wrong. The correct idea of a good margin to a page is that the fore-edge and tail should be greater than the back and head margin. From a binder's point of view, the surrounding margins of a printed page of a book are somewhat defined as shown in fig. 75.

From a printer's standpoint, taking a sixteenmo as our example, the marginal portions of a sheet, simply for

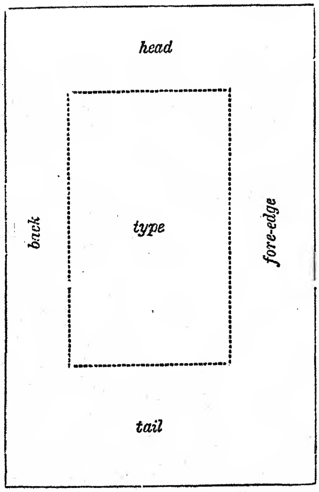


FIG. 75. MARGINS OF A PAGE.

the convenience of gauging the furniture, are named as in fig. 76.

Some printers call the *back* the gutter and the *long cross* the back, but we prefer our method, as the back here quoted is really the back of the book. The long and short crosses respectively are where the long and short cross-bars of the chase fall.

Margins, to look well and to be proportionate, should be arranged somewhat on the following principles. Books,

especially good ones, issued in cloth, are likely to be rebound in leather at some future date, and, if cut again, would suffer most on the fore-edge and tail, where, consequently, a larger margin is desirable. This, too, allows of wear and tear, which occurs more generally on these edges of a book. Further, if old books are studied in this respect, particularly those of the famous presses, English and foreign, and even MSS. of an earlier period, it will be found

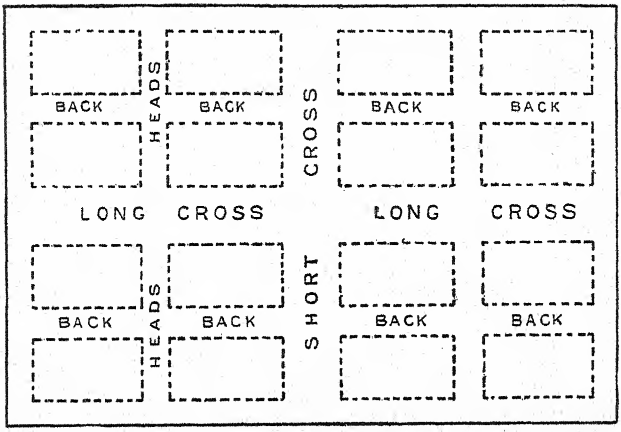


FIG. 76. MARGINS OF A SHEET.

that this idea was frequently carried out, possibly with a view to allow of annotations in the margins. Bearing in mind what was said a little way back, that the length of a page on paper should be regulated by its width, the head margin should be a little more than the back, and rather more margin at the tail than on the fore-edge, because, by some optical illusion, an equal margin generally looks less in the head, perhaps caused by the two open backs of the book. Fifty per cent. more margin on the fore-edge and tail than

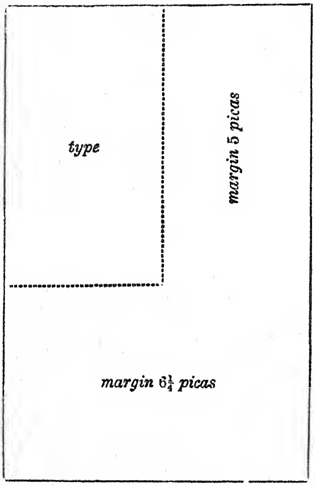


FIG. 77. TYPE AS TO PAPER.

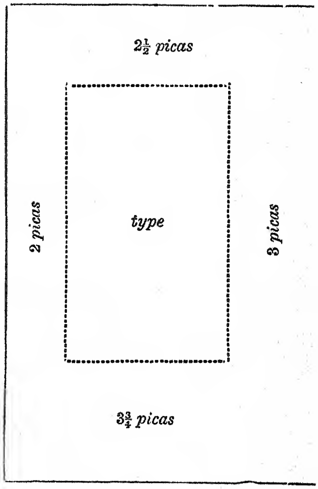


FIG. 78. MARGIN PROPORTIONED.

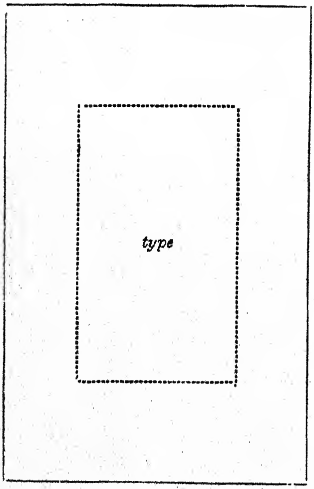


FIG. 79. PAGE CENTRED.

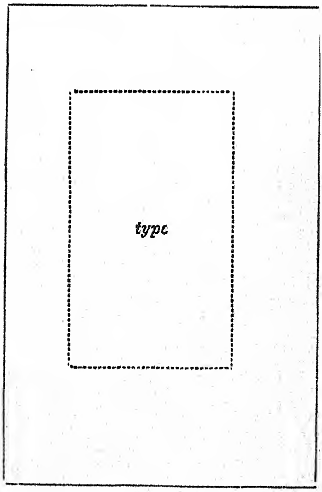


FIG. 80. PAGE WITH PROPER MARGIN.

on the back and head respectively looks well, and it can, of course, be made more or less according to taste. The diagrams opposite, figs. 77 and 78, will show the proportions worked out.

We also give a centre, or equal, margin round a page, fig. 79, for comparison with the one we suggest, fig. 80,

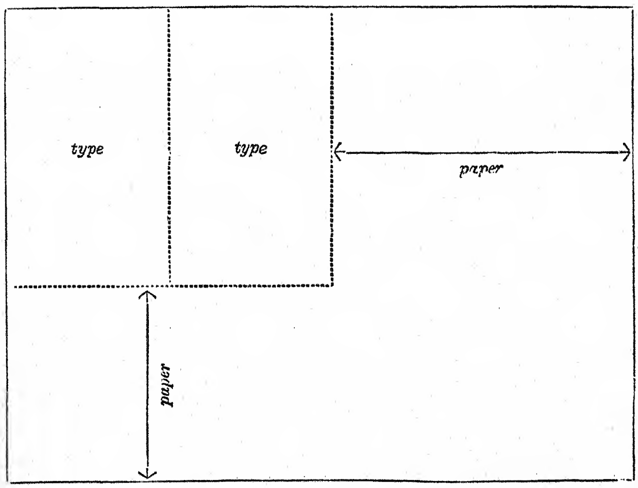


FIG. 81. ADJUSTING MARGIN.

which, we contend, gives a better proportion than the other.

An easy way to fix these margins, supposing the book is an octavo, is to fold the sheet into four, or quarto, and measure the length and width of two pages, as in fig. 81. Then calculate the spare margin between the arrows, and if the rule we laid down as regards proportion be adopted, place two-fifths in back or head, and allow three-fifths for fore-edge and tail. When this is done, it must be made out to

paper at the cross, where the fore-edge of the book will fall when the sheet is folded up, fig. 82.

By thus adjusting the furniture the sheets, when dealt

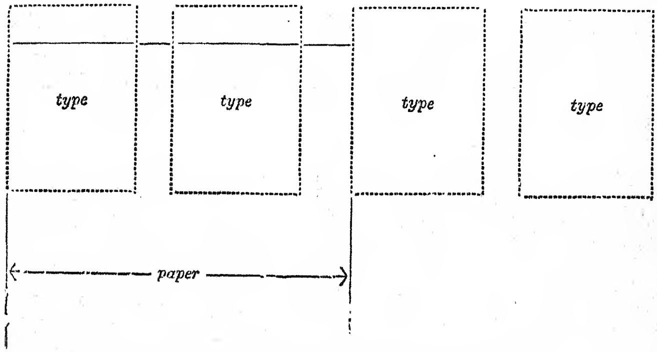


FIG. 82. ADJUSTING FORE-EDGE MARGINS.

with by the binder, come out with equal margins on the fore-edge for octavo. In other sizes, with a greater number of pages, the sheet should be turned the other way and made out lengthwise precisely in the same manner.

Type measures.—For measuring purposes a *pica-gauge* or *type-scale,* fig. 83, marked with pica ems, should be used. These may be obtained either in ivory or boxwood of the material-maker or type-founder; they also

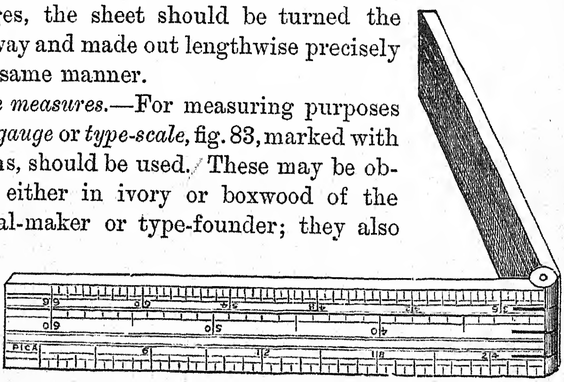


FIG. 83. TYPE SCALE.

contain the marked ems of other bodies. A home-made one can be manufactured by the pica ems being marked on a piece

of four-to-pica brass rule. In purchasing a measure, however, it is best to procure one which has the standard bodies of those founts in use, as some of the types other than pica vary somewhat, the true remedy for which would be the adoption of the point system.

The *furniture* to be placed round the forme is the next thing to be considered. The terms "dressing" or "clothing" a forme are sometimes used—a forme laid up for distribution and stripped of its furniture is expressed by the opposite term, *i.e.*, "naked." Assuming that we have a sixteenmo forme to "dress," it is best that all the furniture used lengthwise should be a little longer than the page itself—say a couple of picas at least. That used in the width should not exceed the measure of the work, and care must be taken that it is not too long, or else it will cause a "bind." The furniture down the length of the page being longer obviates the possibility of any lines slipping, provided it has been placed properly, so as to include both ends of the page. The side- and foot-sticks should be a little longer than the parts they have to secure, but just sufficient to prevent overlapping each other either one way or the other. When this is done, the page-cords may be removed from the pages, the inner pages being untied first, and, as each page is released, the surrounding furniture must be pushed up so as to protect it. As the cords are removed, be careful not to get them entangled; place them round the neck temporarily, and when done with hang them on a nail for future use. The quoins may now be fitted; in doing this, supposing there is a large amount of space to fill up, do not use two quoins together, as in fig. 84, but use short lengths of furniture kept for locking-up purposes, as distinct from that used for making margins between the pages, which should be perfectly sound and not damaged in any way. Using two quoins together is extravagant, and will not permit of the forme being locked-up tightly or squarely, as a moment's reflection will

show, on comparing a quoin and a side-stick together, fig. 85. The use of leads in quoining-up is to be deprecated as a wasteful and slovenly habit. We repeat that furniture which is worn and not good enough for placing between pages to form margins is of service in quoining-up; therefore the use of good furniture for this purpose should be forbidden. When formes are sent to press or machine

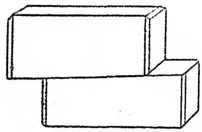


FIG. 84. WRONG USE OF QUOINS.

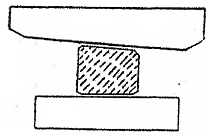


FIG. 85. RIGHT USE OF QUOIN.

great care should be exercised in straight-edging after gauging-up the margins, and one scaleboard at least should be placed on either side of the cross-bars; this will allow of correct register being easily obtained if the pages do not back properly. When the first forme has been approved for margin, a *furniture gauge* should be made, say of card, in order that all the successive sheets of the same work may be made quite uniform.

CHAPTER VII

Locking-up Formes—Pulling the Proofs—Making Corrections in the Metal—The Space Paper or Box—Signs and Marks used by Readers in Correcting Proofs—Clean Proofs—The Forme Carriage.

AFTER quoining-up the forme and seeing that the furniture is in its proper position, the type may be lightly planed down with the planer, fig. 45. Let each stroke with the mallet hit the planer firmly and flatly, and do not drag or push it over the surface of the type. In locking-up, always tap the foot of the pages up first; this prevents the springing and bending of the leads, if a leaded work; but, in unlocking a forme, unfasten the sides first for the same reason. The whole forme should be locked-up equally all round, and not too tightly, as much pressure will cause the pages to spring. This fact can always be detected in re-planing down after locking-up, for if the type is on its feet, as it should be, the slightest touch will make it apparent. Should the forme have sprung, unlock it and put it square or on its feet again—by no means attempt to force it down by the use of the planer. After the planing has been performed satisfactorily, the forme should be raised very carefully, just a little, to see if the whole lifts. Should it not, it may be due to bad justification of lines, "binding" of furniture, or imperfect gauging of pages or furniture. All being well, the proof can be taken and passed over to the reading department for comparison with the copy; this proof being termed a "first" proof.

When the proof has been corrected by the reade
forme should be laid upon the imposing surface a
locked in the manner already described.

Making corrections.—The compositor should hav ...ace *box*, fig. 86, a small tray usually containing six divisions; these hold the spaces of the type to be corrected.

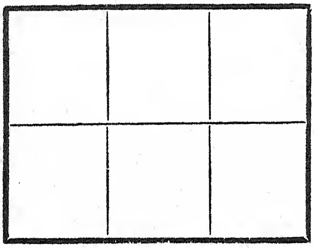


FIG. 86. SPACE BOX.

Assuming the corrections are not very heavy, gather the necessary letters in the fingers, and when as many have been collected as can be comfortably held, place them between the first and second fingers of the left hand, fig. 87; then, with the help of a bodkin, proceed to correct the errors as marked in the proof. In substituting other letters be careful to see that the alteration leaves no difference in the justification; if it does, space the line out again as before. In the case of any omissions or repetitions of words—called respectively "outs" and "doubles"—it is best to lift out that portion of the matter likely to be affected by the error, place it on a galley, and put it through the stick again; this insures better justification, and will facilitate the correction in the long run—do not attempt to do it in the forme. Certain signs and marks are used by the readers in correcting the proofs; the two samples given at pp. 115-116 will give the usual characters in vogue in most offices. It is perhaps best for the learner to compare each separate mark with the corrected page (p. 117). The following is an explanation of some of the signs:

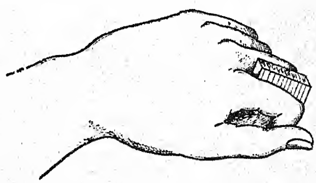


FIG. 87. HOLDING CORRECTIONS.

Page as corrected.

ot try to correct the faults of hurried making-ready by a weak impression, and by carrying an excess of ink to hide the weakness. Excess of ink fouls the rollers, clogs the type, and makes the printed work smear or set off. A *good* print cannot be had when the impression is so weak that the paper barely touches the ink on the types and is not pressed against the types. There must be force enough to transfer the ink not only on to the paper, but into the paper. A firm impression should be had, even if the paper be indented. The amount of impression required will largely depend on the making-ready. With careful making-ready, impression may be light; roughly and hurriedly done, it must be hard; indentation is evidence of wear of type. The spring and resulting friction of an elastic impression surface is most felt where there is least resistance—at the upper and lower ends of lines of Type, where they begin to round off. It follows that the saving of time that may be gained by hurried and rough making-ready must be offset by an increased wear of type.

That impression is the best for preventing wear of type which is confined to its surface and never laps over its edges. But this perfect surface impression is possible only on a large forme with new type, sound, hard packing, and ample time for "making-ready." If types are worn, the indentation of the paper by impression cannot be entirely prevented: good presswork does not depend entirely upon the press or machine, neither on the workman, nor on the materials. Nor will superiority in any point compensate for deficiency in another: new type will suffer from a poor roller, and careful making-ready is thrown away if poor ink be used! It is necessary that all the materials shall be good, that they should be adapted to each other and fitly used. A good workman can do much with poor materials, but a neglect to comply with one condition often produces as bad a result as the neglect of all. If the foregoing facts

Clean proofs.—When the proof has been corrected, it is customary, in the absence of other instructions, to pull two clean revises to send out to the author or customer, but should the compositor have failed to make good all the errors in his first proof, he would have to correct the forme at his own expense the second time; therefore it is to his advantage to use every care in his corrections, especially if he is a piece hand.

The different stages here enumerated, viz., composing, distributing, making-up, making margins, imposing, and correcting, are those applied to bookwork. The same operations also apply to jobbing and newspaper work to a great extent.

A useful carriage for moving formes about is the *forme trolley*, fig. 88. Rubber tyres are sometimes placed round the wheels to render them noiseless, and to prevent injury to the floors.

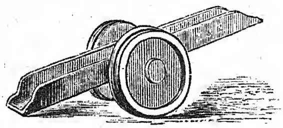


FIG. 88. FORME TROLLEY.

CHAPTER VIII

Jobbing Work—The Character of Types used—Wood Types and their Receptacles—To Preserve Wood-letter and Cuts—Ornaments, Borders, and Brass Rules—The Classification of Faces—The Adjustment of Border Rules—Curved Work.

SOME amount of taste and practice is required in the setting-up of commercial or *jobbing work.* This is a large subject, embracing all kinds of small work, such as circulars, cards, programmes, invoice and memorandum forms, etc.

Jobbing types may be obtained in three classes, so to speak—plain, fancy, and grotesque or fantastic. The last variety is to be shunned if really good taste is to be displayed, and this rule is applicable to the type ornaments and borders of the same kind. Over-ornamentation or elaboration is to be avoided in displaying, for nothing after all is so effective as boldness and simplicity. A few specimens of jobbing or fancy types have already been given. Whilst simplicity is recommended, it is not desirable that a printer should never add new faces to his stock. Curved lines and an excessive amount of rule-work, we venture to think, are not in keeping with letterpress printing; such work is more in harmony with lithography. Special cases for jobbing types are made by the printer's joiners, and double and treble cases have already been shown, figs. 20 and 21. The selection of these, however, should be determined by the size of type and the quantity to be in

circulation. Wood-type, used for broadside and similar work, should be kept on trays or special shelves for the purpose—the plan shown here, fig. 89, is a convenient one.

To Preserve Wood-Letter and Cuts.—To prevent warping in blocks and wood-letter used in large bills, they should be placed in a zinc basin, provided with an air-tight lid, and then thoroughly saturated with paraffin oil; after being left thus for about four days, they should be wiped

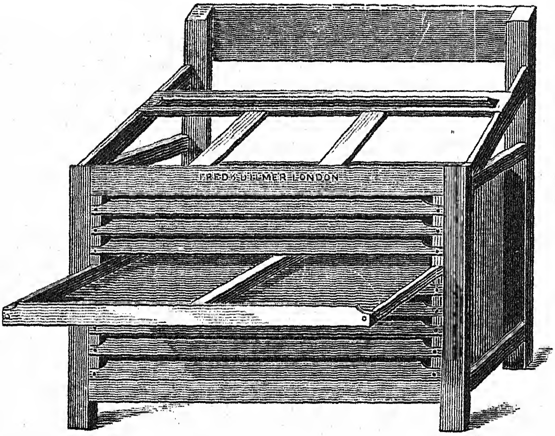


FIG. 89. TRAYS FOR WOOD-LETTER.

with a clean, dry rag. Prepared in this way, when new, wood-letter is said to resist the effects of lye, petroleum, turpentine, and atmospheric changes if not very extreme. Care should be exercised that wood-letter is not allowed to become too wet in cleaning, but dried as much as possible with the aid of rags. Again, avoid placing near steampipes or standing in the heat of the sun.

Ornaments, borders, and brass rules of the different varieties should all have their proper places. The special case given in the earlier portion of this work is a useful

article, especially for short lengths. These may include the short fancy or "*French*" *rules*, fig. 90, used for displaying purposes.

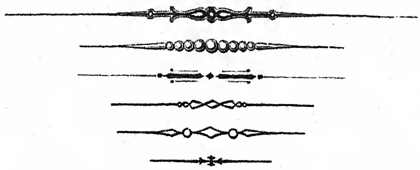


FIG. 90. "FRENCH" RULES.

Jobbing work involves a great deal of display as a rule, but each class of jobbing requires a different treatment; what would be effective in a poster would be vulgar for a smaller job, such as a small show-bill. Regard must be given to a customer's taste and the nature of the work. Having taken these two things into consideration, the next point is to study the copy and find the most important lines requiring prominence. In setting, do not mix indiscriminately old face, old style, or modern faces, but keep to one class as far as possible. Use extended or condensed founts only where absolutely necessary, such characters being out of place when used simply for the sake of effect rather than necessity. For commercial announcements perhaps a bolder display is required, but for private work, such as circular letters or invitation cards, a more simple style may be adopted. Where ornamentation is used, do not crowd the lines in order to make room for the design, but rather use ornament as a secondary consideration. In selecting these do not mix the style, but keep to the same character as the type, for it is inconsistent to use, say, a gothic kind of ornament with light and modern types. If fancy types are adopted, use them sparingly. A golden rule to be observed is that a job is best displayed all in one character of type, and in as few sizes as possible.

Where rule borders are required, it is best to mitre the corners in order that they may join correctly. For this purpose special mitring machines may be obtained, but if the brass rule to be used is not thicker than four-to-pica, it may be filed at the ends to an angle of forty-five degrees

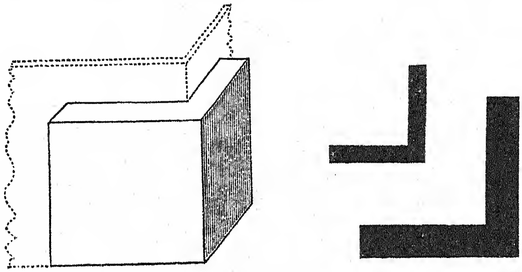


FIG. 91. METAL CORNERS.

to allow of a square border being obtained. In selecting brass rule it is best as far as possible to confine the choice to one thickness, for it is very confusing to have several thicknesses in general use. Where rule-borders are required for a series of pages, it is, however, best to have thicker

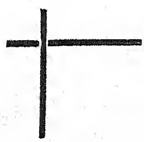


FIG. 92. OXFORD CORNER.

brass, for the stouter it is the better it will join when locked-up, provided the mitres are true. Metal *corners*, fig. 91, are very useful in mitred rule-work, making it easy to obtain a perfect join at the corners, especially if placed both inside and out. They are cast the same height as quadrats.

Oxford corners, fig. 92, may be made in two ways—by giving the full length one side, and carefully cutting and

justifying the small odd piece of the other corner, or by taking a riband file of the proper thickness and mortising slots at the ends, a little below the centre of the height—of course reversing half of the rules first. When finished, they can be fitted in over each other, thus forming a perfect and fixed frame.

If curved or circular lines are really required in certain jobs, there are various ways of making them. Special pieces

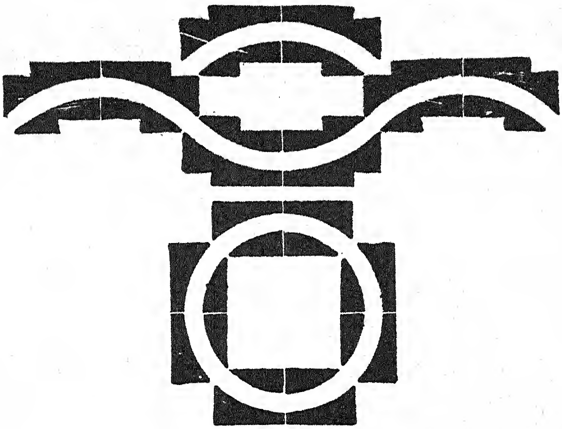


FIG. 93. METAL CURVES.

of metal can be obtained, somewhat of the nature of the above designs, fig. 93, cast to different widths and sizes, and there are other methods invented and sold by the different type-founders, but for general and miscellaneous work they may be improvised with a little ingenuity. Brass rules, of a soft calibre, and leads may be adopted for this purpose. After determining the shape and extent of the curve, bend your material to the size. Two corresponding pieces of the curving material will be required to hold the line on either side in its position. If only a small curve is

needed, it can be built up in the composing stick, but if a large one, it must be boxed in on the galley by means of furniture placed round in order to keep it in its defined position. After the line is set, it must be gradually squared up by means of the lines of type on either side of it, with quadrats of various bodies to assist it. If the angles are too sharp, and more solidity is wanted, plaster of Paris may be used to fill up the interstices, care being taken not to make it too liquid, as it will take a long time in drying and setting hard.

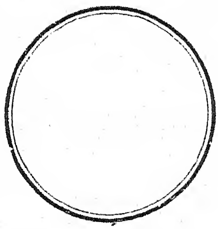


FIG. 94. BRASS CIRCLE.

For the printing of certain designs, *brass circles*, fig. 94, and oval shapes of various sizes can be obtained. Those cast on square bodies are recommended for simplicity in justifying with masses of type.

CHAPTER X

Newspaper Work—The Qualifications necessary for News-hands—Making even—Composing Machines in the Market—The Linotype, Monotype, Typograph, and Thorne Machines described.

IN *newspaper work*, where hand work still prevails, the ordinary compositor performs a somewhat perfunctory part, composing and distributing alternately being his task all the year round. The charge of and the giving out of copy, the making-up, and in fact the entire control of a paper, is in the hands of the "printer," as the responsible person is called, with his subordinate. The payment is determined by lines and galleys—a galley being dependent on size of type. Minion is almost exclusively adopted for news-work. It is requisite that all compositors employed in this class of work should be expeditious and careful in their work, a clean proof being a great recommendation for a news-hand. A mere type-lifter, one regardless of errors, would soon be despatched about his business.

To suit the exigencies of the early issues, and otherwise to expedite the composition, copy is given out in very small "takes"; each man has to "make even" in the absence of a paragraph ending, therefore good spacing has very largely to be sacrificed. Bad spacing can be obviated to a great extent by practice and foresight on the part of the compositor. In the case of most newspapers, at any rate those of a medium or large circulation, the formes, as soon as made up into the required pages, are sent to the stereotyping

department, and it is astonishing how quickly finished plates can be turned out for printing purposes. For short numbers perfecting machines are mostly used, whereas for the longer ones rotary machines, requiring stereotype plates curved or bent for attachment to the type cylinders, are made, and these are printed from a continuous web of paper, perhaps two, three, or more miles in length. These machines have the necessary appliances for damping, reeling the paper, and cutting and folding in very many instances. The necessary laying-on and taking-off are purely mechanical, and thus the whole is automatic. These machines will be referred to in due course. In the ordinary way there is nothing particular in the production of newspaper work, beyond its wonderful resources for turning out great numbers of copies in a short time, but this applies more to the actual printing operation, whilst the mere composition is a bare repetition day by day, and therefore does not call for any particular description.

As a matter of fact, most newspaper type-setting, and much of magazine work too, is done by mechanical means. The machines are of various kinds, and it is appropriate here to give an account of some of the principal ones in use at the present time.

It is without question that machine composition has "come to stay," and that the different machines are admirably adapted for work of the kind just mentioned will be admitted by all. Although some extremely good specimens of work are offered showing the capabilities of the different methods, we think the time is hardly ripe for their general employment in bookwork—at least not for the best class of such work.

That the time will come there is not a shadow of doubt, especially as the various details of the different machines are fast being improved from time to time. Both newspaper and magazine composition is all straightforward work, and

thus plain sailing, but bookwork demands the best of type faces, and a large range of sizes. Each book, as a rule, unless one of a series, is laid down on different lines, and although the changing from one fount to another has been very much simplified lately, the facilities and varieties offered are not yet quite sufficient for the bookprinter desiring to turn out all-round work, although adapted for the more ordinary class. But we repeat that it is only a matter of time, and indeed that time is not far distant when hand-composition will be a very limited method of production.

The *Linotype Composing Machine* we will take as our first example. It is not a type-setting machine in the ordinary sense of the word, but is a machine which, being operated by finger-keys, like a typewriter, produces type matter ready for use on the press or stereotyping table.

The machine marks a departure from the ordinary method of using single letter type. It produces and assembles, side by side, metal bars or slugs, each of the length and width of a line of type, and having on the upper edge the type characters to print an entire line. These bars, having the appearance of solid lines of type, and answering the same purpose, are called " line o' types." When assembled side by side on a galley, they are ready for making up into a forme, presenting the same appearance as if composed of ordinary type, and adapted for use in the same manner. After being used, the linotypes are returned to the melting-pot to be re-cast into other lines, thus doing away with the cost and labour of distribution.

The Linotype machine contains, as its leading members, a large number of small brass matrices, consisting each of a flat plate, having on its vertical edge a female letter or matrix proper, and in the upper end a series of teeth, used

for selecting and distributing the matrices to their proper places in the magazine. A machine fount includes a number of matrices for each letter, or character, represented on the keyboard. The magazine contains a series of grooves, down which the matrices slide, and from the lower ends of which they drop one by one when released by the operation of the keyboard.

The machine is organized to select matrices bearing the required characters, and set them up in line side by side with intervening spaces, in the order in which they are to appear in print, and thereafter to present the line to a mould, so that the linotypes or slugs may be cast against and into the line of matrices and spaces at one operation.

These operations are effected by a mechanism which represents in outline the principal parts of the machine.

In fig. 95, A is an inclined stationary magazine or holder, containing channels in which the assorted matrices are stored. The matrices tend to slide downward out of the magazine by reason of their gravity, but they are held in check by escapements B, one at the mouth of each channel. From these escapements, rods C are extended downward to a series of finger-keys D. There is a special key for each character or letter. The keys are depressed by the operator in the order in which the corresponding characters are to appear in print. Each time a key is acted upon, it permits a single matrix, bearing the corresponding character, to fall out of the mouth of the magazine and downwards through the channels E, to an inclined travelling belt F, by which the matrices are carried downward one after another and delivered into the slotted assembling block G, in which they are set up, side by side, in a line or row.

A stationary box H contains a series of space-bands I, and a delivery device is connected with finger-key J, by which the spaces are discharged and caused to fall into the

line at their proper places. Thus, by operating the keys, the required matrices and spaces are delivered one after another

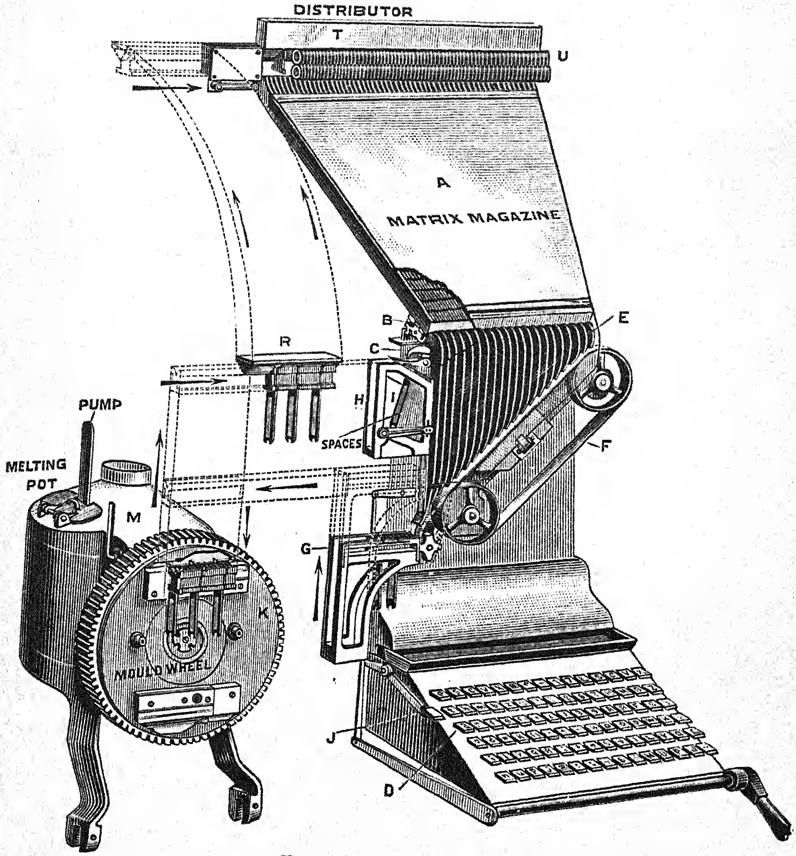


FIG. 95. THE LINOTYPE.

and assembled in line in the block G, until it contains all the characters necessary to complete one line of print.

After the line of matrices is thus composed, it is transferred to the face of a vertical mould wheel K, through which a slot extends from the front to the rear face. While the line of matrices and space-bands is in front of the mould, the wedge-shaped space-bands are forced upwards, and in this manner exact and instantaneous justification is secured.

The entire row of characters in the matrix line is thus presented directly opposite the face of the mould or slot, and when the mould is filled with metal to produce a slug or linotype, the metal will flow into the matrices, which produce their respective type characters in relief on the edge of the casting.

Behind the mould wheel there is arranged a pot M, in which type-metal is maintained in a molten condition by a flame from the gas-burner thereunder. The pot has a delivery mouth, or channel, adapted to fit against and close the rear face of the mould. Within the pot there is mounted a mechanically-operated pump plunger.

After the line of matrices is presented and locked against and across the face of the mould, the mouth of the pot is closed against the rear side of the mould, and the plunger then forces the molten metal from the mouth of the pot into the mould, in which it solidifies, completing the linotype.

After the linotype is thus produced, the mould wheel makes a partial revolution, turning the mould slot from the horizontal position in which it stood during the casting operation, to the vertical position.

While the mould stands in this position, a horizontal pusher, having a blade attached, advances from the rear and pushes the linotype forward out of the mould and between the trimming knives into the galley on the front of the machine. A vibrating arm advances the linotypes one after another into the galley, in which they are thus assembled side by side in column form.

In order to secure absolute accuracy in the height and thickness of the linotypes, knives are arranged to plane them at the foot, and to trim the sides during their course to the galley.

After the assembled matrices have answered their purpose in front of the mould, it is necessary to distribute and return them to the magazine, from which they are again in due time discharged for use in succeeding lines. The line of matrices is first lifted vertically, and then laterally until the teeth of the matrices engage the ribs of the bar R. This bar then rises, lifting the entire line of matrices to the distributing mechanism at the top of the magazine. The space-bands remain behind when the matrices are lifted to the distributor, and are transferred laterally to the box or holder H, to be used again.

The distribution of the matrices to their proper channels is effected by mechanism of extreme simplicity, as follows:

Each matrix has the teeth in its upper end arranged in a peculiar order, or number, according to the letter which it bears. In other words, a matrix bearing any given letter differs, as to the number or arrangement of its teeth, from a matrix bearing any other letter, and these teeth are relied upon as the means for effecting the distribution. A rigid steel bar T is fixed in position above the open upper ends of the magazine channels, and is formed at its lower edge with longitudinal ribs, adapted to engage the teeth of the matrices and hold the latter in suspension. The ribs of the distributor-bar vary in number and arrangement at different points in its length, in correspondence with the varying teeth of the different matrices.

The matrices to be distributed are pushed horizontally upon the bar at one end, so as to be suspended therefrom, and then moved by longitudinal screws U along it over the mouths of the channels. Each matrix will remain in engagement with and be suspended from the bar until it

arrives over its proper channel, where the arrangement of teeth permits the matrix to disengage so that it falls directly into its own channel. The movement of the matrices, as already mentioned, is effected by means of longitudinal screws U, which lie below the distributor-bar in position to engage the edges of the matrices and slide them along the bar. It will be observed that the matrices pursue a circular course through the machine, starting from the mouth of the magazine, and passing downward to the line in which they are assembled; thence to the mould, to produce the letters on the linotype, and finally back to the distributor-bar, from which they fall into their proper grooves in the magazine.

It is this circulation of the matrices, and the fact that the operations of composing one line, casting from another, and distributing a third, are carried on concurrently, and without interference, that enables the machine to operate at the speed of from eight thousand to twenty thousand ens per hour.

The mould wheel is fitted to carry two or more moulds, any one of which may be instantaneously brought into use. The universal mould is adjustable for all bodies and measures. Sectional moulds are also provided for casting a series of short slugs in one operation for tabulated matter, etc.

The double magazine Linotype machine has two quick change magazines always in place, and each of these magazines contains a complete set of double-letter matrices, all of which can be used in a single line, set from one keyboard. The two magazines are placed one above the other, a special keyboard enabling either to be brought into immediate operation, the change being easily effected by the movement of a small lever. Thus as many as four complete founts or 360 characters are provided for instant use. As one or both of the magazines can be lifted from the machine and

others substituted in a few seconds, a further new equipment of 360 characters is quickly obtained. The machine takes all sizes of type up to English, and as the operator can change instantly from one fount to another (introducing clarendon, italic, or roman in the same line), the most intricate work—tabular, headlines, marginal notes and sub-titles can be composed from the keyboard.

A later model (No. 4) has three superimposed magazines. Any one of the magazines may be brought into immediate use by the operator without moving from his seat. This model has a magazine capacity of 540 characters, and can be equipped to set lines up to thirty-six pica ems.

Another new model (No. 9) is a four-magazine machine, giving 720 characters from the standard keyboard of ninety keys, setting faces and bodies from five to thirty-six point in measures from four to thirty pica ems. Matrices from all four magazines can be assembled in one line, and the distribution is automatic and concurrent. This machine has a universal ejector capable of instant adjustment for change in length of line, and a water-cooled mould wheel.

A small model single-magazine machine (No. 10) is also now obtainable. The magazine is smaller and holds fewer matrices than the standard models. It is designed to meet the requirements of small offices. This model takes any body from Ruby to Small Pica, and casts lines up to thirty pica ems.

The *Monotype*. In describing the "D" pattern keyboard, fig. 96, it may be said that it is also somewhat similar to that of a typewriter, and controls 225 characters, each alphabet having the same layout as a typewriter. In the "Standard Book and News Layout," the left-hand bank contains the roman upper and lower case, small caps, and

figures; the right-hand bank, italic upper and lower case, fractions and sorts, etc., but by means of interchangeable button banks, and the corresponding key-bar frames, the latter being intermediate between the keys on the button-banks and the valves, a change can thus be made from the standard layout to seven alphabets, which contains the above five alphabets with an upper and lower case black face in addition, or any other required in a few minutes.

The "DD" pattern is a precisely similar machine, but is equipped with two paper towers and two em scales which allow the work to be set in two different body sizes and measures at the one operation; thus a Bible can be set in Pearl four ems and English fifty-six ems at the one time, every line of each body size being perfectly and automatically justified.

Thirty more keys at the head of the board are red with white figures—two sets from 1 to 15—and utilized for justifying, and the two keys (green) being placed at the bottom of the key-banks which are for use in ascertaining the necessary amount to be spaced out and in returning the calculating and recording mechanism (for column widths) back to zero at the end of each line.

When the finger pressure is removed the keys fly up to the original position, but in the meantime the released air has forced up one or two punches at the back of the board, and these punches make two small circular perforations in a strip of paper, which is rolled off one spool on to another an eighth of an inch at every pressure of a key. The copy is thus translated letter by letter and space by space into a series of combinations of perforations in this paper strip, which is automatically rolled up ready for use on the casting machine.

Although there is only a total of 31 punches, no key drives up the same combination, every key having its own

special perforation or perforations. One key—the quad—does not perforate the paper at all.

Whilst these perforations are being made a special mechanism is counting the number of spaces in the line,

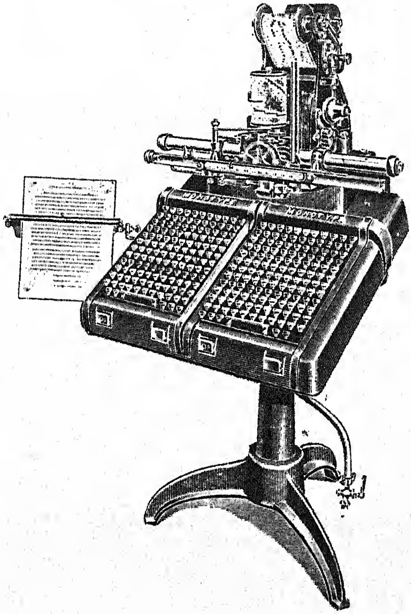


FIG. 96. MONOTYPE KEYBOARD.

and the number of en spaces occupied by the characters the keys representing which are pressed by the operator. When the operator (the end of the line being indicated by the ringing of a bell four ems from the end) from his experience as a compositor knows he can get no more in a line he presses one of the green keys at the bottom of the

board, which causes a drum to revolve a certain distance according to the distance between the end of the line and the point at which the scale shows the letters composed would occupy in such line if normally spaced. This movement causes a pointer to indicate two numbers, say 4 and 15, these representing the red or justification keys, which are to be pressed to bring about a full line: this operation will cause the casting machine to cast the spaces in that line of such an increased thickness laterally that the line will be full and perfectly justified.

This justification is a simple matter. The figuring on the drum has been arrived at by calculations showing the result of a division of any number of ems less than four over any number of spaces not exceeding twenty, and the figures on the drum are arranged in such fashion that in operation those shown by the pointer (which raises one of twenty such possible elevations for each space key depressed) at the end of each line are the numbers of those keys which will make a combination of perforations on the spool of paper calculated to dictate on the casting machine the production, in that individual line, of spaces of the correct size to fill out the line.

The keyboard provides for any width up to 60 ems of any type from Pearl to English.

Measure is altered instantaneously by moving an indicator backwards or forwards on a graduated scale.

The justification drum has to be changed with every fresh face, as the necessary calculations naturally differ with every different width of quad, *i.e.*, with every different set. Consequently each drum is marked with figures representing the set size: 8 for Brevier Modern and 8½ for Brevier Old Style, and so on.

It will thus be seen that the operation of the keyboard is to perforate a strip of paper which will afterwards be used on the caster to determine the order in

which the various types are to be cast and placed in the galley.

This strip, when it reaches the caster, fixes for itself the

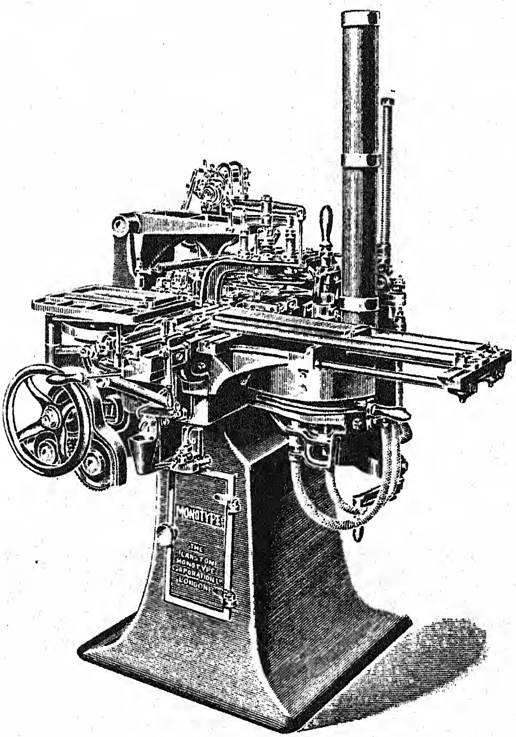


FIG. 97. MONOTYPE CASTING MACHINE.

width of column, but a notification written in pencil at the end of the spool instructs the attendant what matrices should be used and on what body-size the face is to be cast. We now turn to the casting machine, fig. 97. Its mechanism

is mounted on a heavy base for the sake of stability, and raised to the height of about three feet for convenience of working.

This machine comprises a mould, for the casting of the type, mounted immediately above the metal pot, which is filled with molten metal—consisting of certain proportions of tin, antimony and lead, this being maintained at a heat of about 680° Fahr.—and fitted with a high-pressure pump, the well and delivery channel of which is immersed in the molten metal. This mould is open at the top, so a cover is required to complete the shape of the type to be cast, and this cover is supplied by the die-case, which is mounted on a compound slide, and is clamped on the top of the mould at each revolution of the machine. A device is provided for first cutting off the jet at the foot of the type, and then conveying the new type to the channel into which it is ejected, each succeeding type pushing the others in the channel leading to the galley, until the operation of the red or justification key perforations sets the special galley mechanism in motion and results in the line of type being conveyed under a lifting gate into the galley, the gate immediately closing down behind the line, and preventing it from falling back into the channel. Each succeeding line pushes the previously cast lines forward in the galley, until in turn the galley is full, when it is removed, and an empty galley is fitted in its place without stopping the machine. An adjustable galley stop or weight is placed against the first line of type and moves with it along the galley and prevents the type from falling forwards.

The type is cooled by means of a continuous current of cold water passing through a channel surrounding the casting chamber of the mould. The amount of water necessary is only a trickle, except in the case of Pica, for which a larger supply is required.

The die-case, or magazine, three inches square, contains

225 matrices, arranged in fifteen rows of fifteen each, and these are set up in conformity with the relative positions of the character keys on the keyboard—if the keys have their positions changed on the keyboard, corresponding changes are made in the arrangement of the matrices in the die-case.

If the machine had no other parts than those mentioned, it would cast a given type with every revolution, and place that type in the galley, but it is necessary for the type to change with each revolution in accordance with the requirements of the composition, spaces or character types following each other in rapid succession. The die-case must therefore change its position on the mould so that the precise character of type required may be cast, and this is done by the use of the spool of perforated paper.

The operator sees that the spool necessitates the use of a set of matrices, say Brevier Old Style on the Standard or Book Layout; that it is to be cast on a Long Primer mould so that the matter will appear leaded with a six-to-pica lead. Accordingly he inserts the proper die-case, and puts on a Long Primer mould. He places his spool in a basket, and the end of the paper strip under an air pressure bar, and starts his machine. With each revolution the paper advances one marginal perforation, thus bringing the combinations of character perforations under the pressure bar one at a time. Under this pressure bar, which is supplied with compressed air, is a row of thirty-one holes leading into tubes, and as each combination is presented air gets through the perforations into the tubes immediately under them. Of these thirty-one tubes fourteen are carried to a casting behind the die-case, fourteen to a similar casting at right angles to a line drawn between the first casting and the die-case. These castings are fitted with fourteen pistons, which are blown up whenever air gets under them, and when up stop the travel of a rod governed by mechanical

devices attached to the die-case. In each case the fourteen pistons and a zero stop give fifteen positions, in which this rod, and therefore the die-case, may be arrested, and multiplying fifteen by fifteen gives the 225 positions necessary to enable any one of the 225 matrices in the die-case to be held over the mould orifice whilst a type is cast. This explains the use of the two perforations—one dominating the movements of the die-case from front to back, and the other its movements from right to left.

There are still three tubes to account for. These are carried to small pistons in the centre of the machine, and when blown up cause certain rods to engage in a lifting arm, one resulting in the casting of a characterless space type, and the other two being utilized to regulate the size of the spaces, and to put the galley motion into action at the end of each line.

Accurate alignment is obtained by clamping the matrix on to the mould, a conical pointed steel pin descending into a cone-hole at the back of each matrix, and holding it in position to a tenth of a thousandth part of an inch.

It will easily be understood from the foregoing that once the spool has been perforated it can be used over and over again—air being blown through the holes will not damage it in any way, only care should be used not to tear the spool in taking it off the casting machine.

The nature of this machine and its accuracy are apparent to any one making a cursory examination, but the rapidity of its movements will be better imagined when one is reminded that 165 times in every minute it carries out the following sequence of operations:

1. The perforated paper is moved forward one marginal perforation.
2. The matrix-case is presented to the mould.
3. The matrix is centred by the coning-pin.

4. The mould blade opens out the amount necessary to enable the particular type to be cast its proper width set-wise, that is, laterally.

5. The matrix-case is clamped to the top of the mould.

6. The pump injects the molten metal and the type is cast.

7. The matrix-case is lifted off the mould.

8. The mould jet-blade cuts the jet off foot of type.

9. The carrier throws the jet back into the metal-pot.

10. The type is ejected into the carrier.

11. The type-carrier carries the type out of the mould.

12. The type-pusher pushes the type out of the carrier into the channel leading to the galley.

The functions of composing and casting being thus separated it is necessary to employ one man on the key-board and a boy on the caster, but it is claimed that the system results in greater efficiency for quality, quantity, and range of work, and the extra cost is minimized as the caster attendant efficiently supervises the running of two casters.

A special attachment may be supplied to the casting machines enabling the printer to cast his own display type from 14 point to 36 point.

The *Typograph*, although it has been largely in use on the continent for some years has only lately been introduced into this country. Like the Linotype it is not an ordinary type setting machine, but one which produces lines in solid slugs. Again, the distribution of the matrices is purely automatic.

This machine, fig. 97A, consists of a base carrying the justifying and casting mechanism, a keyboard, and a magazine—which consists of a frame mounted upon a rock shaft, supporting a series of 84 steel runners. The lower ends of these runners converge at the point of assembly, where they form two parallel vertical tiers, while their upper ends are spread out in the shape of a fan. The

matrices are suspended at the upper ends of the runners, and retained by escapements, each escapement being connected by a rod to its corresponding key on the keyboard. The escapement is of the shears variety; the pull on the rod caused by depressing the key raises the front escapement blade and releases the first matrix after the second matrix has been checked by the rear blade. On the return of the key, the second matrix is allowed to come forward to the place previously occupied by the first matrix, after the front blade has descended far enough to check its further movement. Each matrix, as it is released, slides rapidly down its runner to the assembling channel. The line of matrices thus assembled presents their character faces to the mould, an adjustable gauge on the side of the assembling channel showing the operator when the line is of the requisite length. The starting key is then depressed, setting in motion the justifying and casting mechanism.

Justification is effected by circular spacebands, made up of three pieces: the main piece is plain on one side and on the other is formed with a helical face and a cylindrical boss; a loose plate with a projecting arm turns freely on this boss; the portion of this plate which acts in making up the variable space is also made helical on the face next to the main part so that the outer face is parallel to the back of the main part when both helical surfaces are in contact; the plate is retained on the boss by a cover plate rivetted to the main portion. The spacebands are provided with a square hole in the centre of the main part and threaded upon a square shaft, which is rotated by a spring-propelled rack engaging with a spur gear upon the end of the shaft, the projecting arm of the plate being held in a slot. The matrices on each side of a spaceband are thus wedged apart by the action of the helical surfaces, and as all the spacebands in the line are rotated simultaneously, it is obvious that the space between all the words is absolutely even. During the process of justifica-

tion the line of matrices is locked in the vice, which is adjustable to any desired measure.

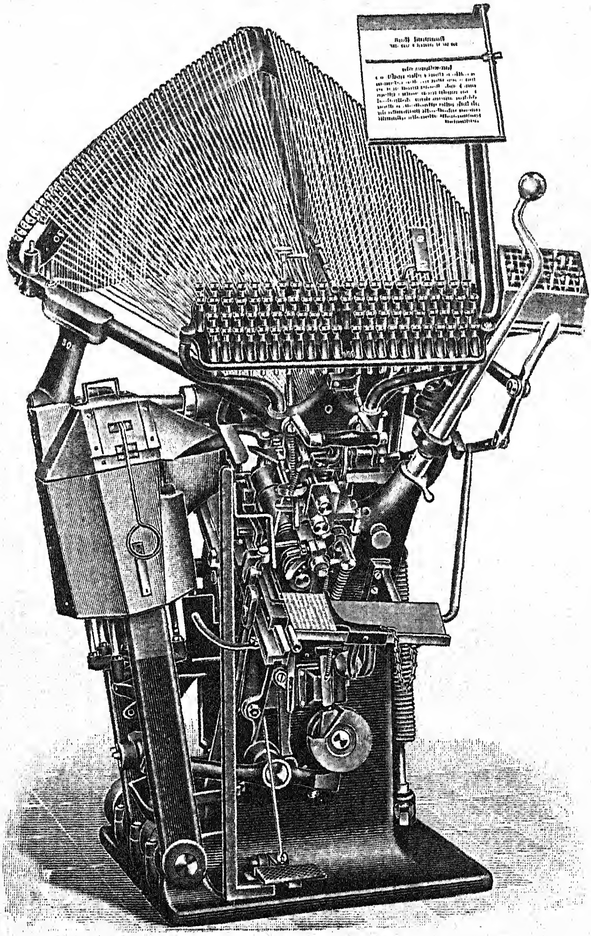


FIG. 97A. THE TYPOGRAPH.

A curved steel bar of square section equal to that of the

spaceband shaft forms a magazine for the spacebands. In the normal position of the shaft relatively to the bar, the spacebands can be made to slide freely from the one to the other in either direction.

The matrices having been justified and aligned, the mould advances and presses against them and the molten metal is forced into the mould by a spring-propelled pump. The slot formed by the various portions of the mould for the body of the slug is plain and rectangular, there being no beads, grooves, or projections in this portion; the back is recessed to a small depth, but only over a part of the length and width, so that the tang joins the slug below the level of the surrounding portion. The tang is formed by a separate tang-plate interposed between the mould and the mouthpiece of the metal pot. The tang-plate moves upwards after the slug is cast, and the metal pot and mould have receded, shearing off the tang. The shearing is actually effected by the steel tang-plate against the type-metal of the recess in the slug, and thus wear is avoided. The slug is then ejected and delivered into a galley. The mould is encased in a water jacket, which prevents over-heating. It sets all sizes from 4 to 14 point—a complete change of face, body, and measure being effected in a few moments.

As soon as the line has been justified and cast (which operation is completed within two seconds after depressing the starting key) the magazine is tilted back, automatically, thereby reversing the angle of the runners, and the matrices immediately slide by gravity to their respective places behind the escapements. When the magazine is tilted back the escapements, which are carried on a separate frame, are raised clear of the runners by a lever having an eccentric movement, so that the matrices can return freely to their normal position. The escapement frame comes back into position on commencing the return movement of

the magazine, so that the escapements are in place before the runners reassume a horizontal position. The operation of distributing the matrices also ensures the return of the spacebands to their magazine.

There is also an ingenious arrangement of two-letter matrices, one character above the other, which enables the operator to set up italics, or small capitals, or black-letter, etc., in the same matter, by the movement of a lever which raises the matrices sufficiently high to cast the alternative word or words of a second fount.

For convenient operation the Typograph requires a floor space of 6 ft. by 6 ft. Where a number of machines are installed an average floor space of about $3\frac{3}{4}$ square feet per machine is sufficient. The extreme height of the machine is 4 ft. 11 in., and it weighs complete about 900 lb.

The driving of the Typograph can be effected by utilizing existing shafting, or by separate motor ($\frac{1}{4}$ h.p.). If several Typographs are driven by one motor and line shafting, $\frac{1}{6}$ h.p. per machine suffices.

Although not so much used nowadays, it is interesting to have as a record the *Thorne* Type-setting and Distributing Machine, which is a good representative of the older kind of those machines employing movable types, specially nicked; its principal features are a keyboard and two vertical cylinders having the same axis, the upper one resting on the lower. Both cylinders are cut with a number of vertical grooves of such a form as to receive the type, which is to be first distributed and then reset. There are ninety of these vertical grooves in each of the cylinders, sufficient to contain enough characters for ordinary purposes. When a key is depressed the letter corresponding with it is ejected from its proper groove in the lower cylinder upon a circular and revolving table which has the same axis as the cylinder, but is of

larger diameter. A number of types may thus be ejected from the grooves at each revolution of the disk, and all are thus brought round in their proper order to a point of delivery where they are conveyed by a travelling band and carried continuously to a setting stick in front of the keyboard and thence to a galley. The necessary justifying is done by a second operator, who sits opposite a small case containing spaces, quadrats, and so forth. The control of the types is effected by forming on the side of each character recesses somewhat like the wards of a key, the arrangement, of course, being different for each different character. The grooves in the lower cylinder are provided with projections corresponding with those on the types, so that no type will fall into any groove other than that for which it is intended. This arrangement applies only to the cylinder, which does not revolve. The grooves in the distributing cylinder are large enough to receive all the types indifferently that are supplied to them. Distribution is effected as follows: An attachment to the side of the upper cylinder enables the operator to place the galley containing the type to be distributed in contact with the cylinder, and, by a very simple device, line after line of type is fed into the cylinder until every groove is nearly filled, and the upper cylinder is caused to revolve upon the lower one, with which it is placed in contact. As the columns of mixed type pass over the heads of the shaped grooves of the lower cylinder, each separate letter falls into its proper groove as the nicks in the types find their corresponding wards.

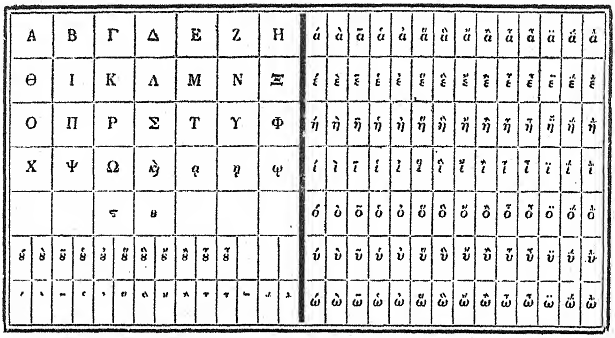
CHAPTER XI

Classical and other Languages—The Cases used for Greek, Hebrew, and German, with Plans of Lays in general use—Rules for Composition in these Languages—German Handwriting.

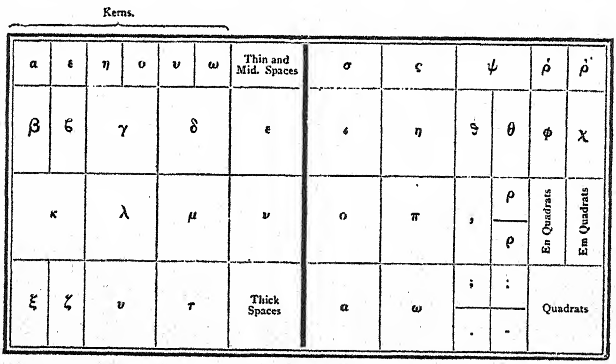
IN connection with composition the classical or foreign languages which require special cases, as also some amount of experience in setting, must not be forgotten. The languages which a compositor has to deal with more generally are Greek, Hebrew, and German. For those different from English, but set in roman types, the ordinary cases, plans of which we have already given, are used. The schemes of the Greek and Hebrew cases are somewhat complicated, especially the former, but if the learner has some superficial idea of the language he proposes to set, or at least is conversant with the alphabet, he will find either circumstance a good stepping-stone to an easy acquirement of the knowledge he seeks. The accents are very confusing at first, but a little perseverance will soon overcome the apparent difficulties, which are more imaginary than real.

GREEK

The plan of *Greek cases* shown, fig. 98, is one generally in use, but offices which make their speciality in printing these languages adopt their own lay, and frequently have cases of a different make.



Upper Case.



Lower Case.

FIG. 98. PLAN OF GREEK CASES.

The alphabet on page 153, and also the one shown on page 161, together with the following rules and suggestions, will, it is hoped, help the student in acquiring a knowledge of the alphabet and accents used in the composition of both Greek and Hebrew.

Greek Alphabet.

Characters.		Name.	Power.	Numerals.
Capitals.	Small Letters.			
Α	α	Alpha	*a*	1
Β	β ϐ	Beta	*b*	2
Γ	γ	Gamma	*g*	3
Δ	δ	Delta	*d*	4
Ε	ε	Epsīlon	*e* short	5
Ζ	ζ	Zeta	*z*	7
Η	η	Eta	*e* long	8
Θ	θ ϑ	Theta	*th*	9
Ι	ι	Iota	*i*	10
Κ	κ	Kappa	*k* or *c*	20
Λ	λ	Lambda	*l*	30
Μ	μ	Mu	*m*	40
Ν	ν	Nu	*n*	50
Ξ	ξ	Xi	*x*	60
Ο	ο	Omi'cron	*o* short	70
Π	π	Pi	*p*	80
Ρ	ρ ϱ	Rho	*r*	100
Σ	σ ς	Sigma	*s*	200
Τ	τ	Tau	*t*	300
Υ	υ	Upsīlon	*u*	400
Φ	φ	Phi	*ph*	500
Χ	χ	Chi	*ch*	600
Ψ	ψ	Psi	*ps*	700
Ω	ω	Omeg'a	*o* long	800

Vowels, Diphthongs, and Consonants.

The Greek alphabet consists of twenty-four letters—seven vowels and seventeen consonants. The vowels are *α, ε, η, ι, ο, ω, υ.*

There are twelve diphthongs, viz.—

Proper: *αι, αυ, ει, ευ, οι, ου.*

Improper: ᾳ, ῃ, ῳ, ηυ, υι, ωι—the point under these vowels denoting that *iota* (ι) is subscribed.

Because capitals have no subscripts, the ι is put in lower case to the capital letters.

The consonants are divided thus—

Gutturals.	*Labials.*	*Linguals.*
κ, γ, χ.	π, β, φ, μ.	τ, δ, θ, λ, ν, ρ, σ.

Again, according to the form in which the organs of speech act in their formation—

Liquids.	*Sibilant.*	*Mutes.*
λ, μ, ν, ρ.	σ.	π, κ, τ, β, γ, δ, φ, χ, θ.

These mutes are also divided—

	Soft.		*Hard.*		*Aspirated.*		*Sound.*
Gutturals	κ	...	γ	...	χ	...	*k.*
Labials	π	...	β	...	φ	...	*p.*
Linguals	τ	...	δ	...	θ	...	*t.*

In compounds, when the first word ends in *s*, the final form of the Sigma (ς) may be used. This form ς sometimes becomes ϛ, when it is equivalent to στ (*st*).

Accents.

Accents are supposed to have been introduced into the language to facilitate its pronunciation for strangers. The ancient Greeks never used them, and it is not an easy matter to tell when and why they were first introduced.

Accents, by the Greeks called τόνοι, tones, are the rising or falling of the voice in pronunciation; which may be considered either separately in distinct syllables, or conjunctively in the same syllable.

There are three accents: two simple, viz., the acute,

ὀξὺς, figured thus (ʹ), which denotes the elevation of the voice; and the grave, βαρὺς, shaped thus (ʽ), to signify the falling or depression of the voice; and the circumflex, περισπώμενος, which was formed first of these two lines or points joined together, thus (^), and afterwards was changed into a round sort of a figure like an inverted Upsilon, thus (ᴖ), but at length came to be figured like an s drawn crossways (˜).

The Acute (ʹ) raises the voice, and is only used upon one of the three last syllables of a word.

The Grave (ʽ) depresses the voice, and can only be used upon the last syllable of a word.

The Circumflex (˜) lengthens the sound, and occurs either upon the last syllable of a word, or the last but one.

The Greek vowels allow of two Spirits, or breathings: the *Asper* (ʽ), which the Greeks use instead of the letter *h*; and the *Lenis* (ʼ), which denotes the absence of the *h*.

All vowels beginning a word have a Spirit over them; but Upsilon (υ) allows of no other than the *asper*.

When the letter ρ begins a word it has an *asper* over it; and where two ρ's come together in a word, the first has a *lenis*, and the second an *asper;* as, ὀῤῥὸς.

The Apostrophe (ʼ) is used for striking out the vowels α, ε, ι, ο, and sometimes the diphthongs αι and οι, when they stand at the end of a word or syllable, followed by another vowel beginning a word or syllable. Elision takes place in all the prepositions, except περι and προ. Sometimes it unites two words.

The Diæresis (¨) is used to separate one vowel from another, and to prevent their being taken for diphthongs.

Every vowel in Greek is pronounced as a separate syllable.

Points.—The comma, the period, and the exclamation in Greek are the same as in English; but the interrogation

(;) is our semicolon; and the colon is a point at the head of a letter, as (·)—nothing more than an inverted period.

ASPIRATES AND ACCENTS.

᾿	Lenis.	῝	Asper grave.
῾	Asper.	῀	Circumflex.
´	Acute.	῏	Circumflex lenis.
`	Grave.	῟	Circumflex asper.
῎	Lenis acute.	¨	Diæresis.
῍	Lenis grave.	΅	Diæresis acute.
῞	Asper acute.	῭	Diæresis grave.

Compositors who are not Greek scholars should pay attention to what has been said above relating to the proper situations of the spirits and accents, as by attending to this many faults may be avoided. The following rules should be committed to memory:

No word can have an *accent*, except over one of the three last syllables.

No *spirit* can be placed over a vowel, except at the beginning of a word.

The *Grave* (`) over the last syllable of a word; and

The *Asper Grave* (῝) and *Lenis Grave* (῍) over a few monosyllables.

The majority of words in the Greek language have an *accent*, and rarely have more than one; when there is a second, it is an *acute* thrown back upon the last syllable from an enclitic, which is not accented, except it be followed by another enclitic. No word can have an *acute* accent over the last syllable but in this case, except before a period, colon, or interrogation, when the *grave* is changed to an *acute*—an occurrence which has led compositors, ignorant of the principles for accenting the same word differently in different situations, to imagine that there was an error in their copy.

NUMERALS.

Numbers are expressed by the whole alphabet and three symbols, which make them to consist of twenty-seven sorts. They are divided into three classes—units, tens, and hundreds; as—

No. 1. *Units.*		No. 2. *Tens.*		No. 3. *Hundreds.*		No. 4. *Thousands.*
α 1	...	ι 10	...	ρ 100	...	͵α 1,000
β 2	...	κ 20	...	σ 200	...	͵β 2,000
γ 3	...	λ 30	...	τ 300	...	͵γ 3,000
δ 4	...	μ 40	...	υ 400	...	͵δ 4,000
ε 5	...	ν 50	...	φ 500	...	͵ε 5,000
ϛ 6	...	ξ 60	...	χ 600	...	͵ι 10,000
ζ 7	...	ο 70	...	ψ 700	...	͵κ 20,000
η 8	...	π 80	...	ω 800	...	͵ρ 100,000
ϑ 9	...	͵ϟ 90	...	ϡ 900	...	͵σ 200,000

Column No. 1 consists of the eight first letters of the alphabet, with this form ϛ (*st*), called ἐπίσημον, which signifies 6.

Column No. 2 contains the eight following letters, with this character ͵ϟ, called κόππα, which signifies 90.

Column No. 3 includes the eight last letters of the alphabet, with this additional character ϡ, called σάνπι, which signifies 900.

The acute (͵) under each letter in column No. 4 stands for a thousand, and the letter expresses the number of thousands signified.

By compounding the above numerals any number may be expressed; as, ια makes 11; κε, 25; ργ, 103; ͵αε, 1,005.

Also, the Greeks sometimes use the following six capitals to express sums, I for 1; Π for 5; Δ for 10; H for 100; X for 1,000; and M for 10,000.

The above capitals may be all four times reduplicated,

except Π; thus, ΙΙ for 2; ΙΙΙ, 3; ΙΙΙΙ, 4; ΔΔ for 20, ΔΔΔ, 30; ΔΔΔΔ, 40.

Sometimes the Delta, Eta, Chi, and Mu are enclosed in a great ⎾⏋, and then the value of the letter is five times repeated; as, ⎾Δ⏋, 5 times 10 are 50; ⎾Χ⏋, 5 times 1,000 are 5,000; ⎾Μ⏋, 5 times 10,000 are 50,000.

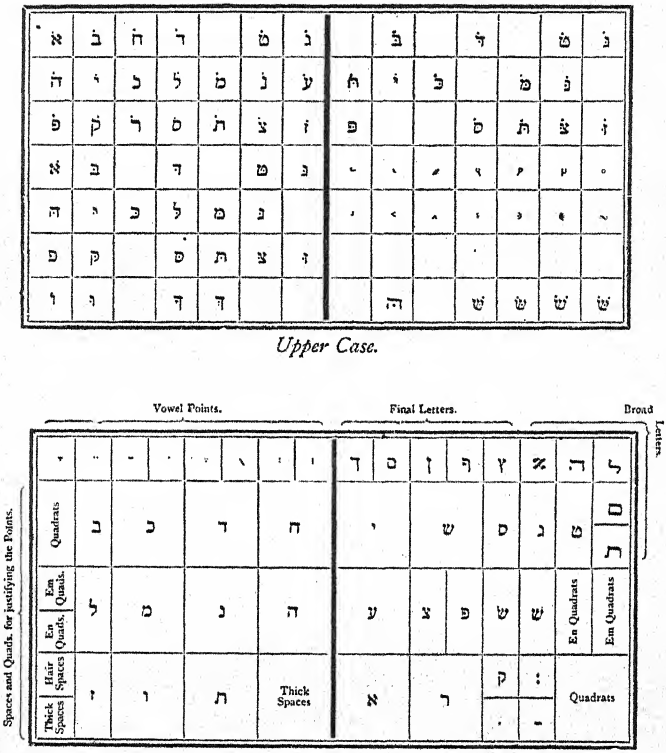
Words in Greek intended to be emphasized or "italicized" are usually hair-spaced.

By following the instructions carefully the student will derive great assistance in composing Greek, and thus avoid a dirty or foul proof.

In turning out occasional words of this language, or even any other, in ordinary roman distribution, they should be laid aside for the moment, and afterwards returned into their proper cases.

HEBREW.

Hebrew cases are almost identical with the roman ones, the upper case containing the same number of divisions precisely as the ordinary upper case; the lower case being similar, excepting a few extra divisions to the larger boxes, fig. 99. This, of course, is due to the fact that far fewer accents are used in Hebrew, or rather, we should say, a smaller number of accented letters—the accents themselves are greater in number than in Greek, but used more sparingly. The learner, therefore, has an easier task in acquiring a knowledge of the cases, but is not called upon so often to exercise that knowledge, as in the ordinary run of book-work, theological works excepted, Hebrew is less used than Greek.



Lower Case.

FIG. 99. PLAN OF HEBREW CASES (WITH POINTS).

From the plan here given it will be seen that the Hebrew cases are laid as near as is possible to the English method now in use. The alphabets have been classified and arranged so as to facilitate the composition; that is, the three different dotted alphabets in the upper case are quite distinct from each other, sometimes being separated by a

thicker partition, to lead the eye of the compositor to it with greater certainty. The lower-case letters are also arranged as near to the English plan as is possible. The א (*a*) in the a box; the ב (*b*) in the b box, etc., so that the compositor can go from a pair of English cases to the Hebrew ones with very little perplexity and a great saving of time, instead of looking over a wide surface of three cases, as formerly, without any classification or arrangement whatever. In composing Hebrew without points the lower case only is required, as the final letters and broad letters are brought into it.

Hebrew is read from right to left, and when it is being set up, the general method is to place the nick of the letter downwards, and when the points are put to the top, to turn the line and arrange those points which come under the letters, taking care to place them in the following order: if the letter has but one leg, the point must be placed immediately under that leg, but otherwise the point must be placed under the centre.

Annexed is the alphabet, which consists of twenty-two letters, with vocal points, accents, etc. The remarks on the similarity of certain letters should be carefully noted, otherwise the student will find it a difficult task to acquire a knowledge of the cases and the manner of composition.

Hebrew Alphabet.

Number and Order.	Characters.	Name.	Power.	Numerals.
1	א	Aleph	*h*, unaspirated	1
2	ב	Beth	*v*, as in van; (בּ) *b*, as in band	2
3	ג	Gimel	*g*, hard; (גּ) *gh*	3
4	ד	Daleth	*d*, as in door	4
5	ה	He	*h*, soft; (הּ) *h*, aspirated	5
6	ו	Vau	*v* or *w*	6
7	ז	Zain	*z*, as in zeal	7
8	ח	Cheth	*kh*, aspirated	8
9	ט	Teth	*t*, as in torn	9
10	י	Iod	*y*, as in young	10
11	כ	Caph	*k* or *c*, hard	20
12	ל	Lamed	*l*, as in law	30
13	מ	Mem	*m*, as in manner	40
14	נ	Nun	*n*, as in nothing	50
15	ס	Samech	*s*, as in sir	60
16	ע	Oin	*ng*	70
17	פ	Pe	*ph*, as in Philip; (פּ) *p*, as in pint	80
18	צ	Tzadde	*tz*, as in howitzer	90
19	ק	Koph	*k*, as in lock	100
20	ר	Resh	*r*, as in road	200
21	שׁ שׂ	Shin Sin	*sh*, as in shine *s*, as in sin	300
22	ת	Tau	*th*, as in thin; (תּ) *t*, as in tin	400

Final Letters.

Caph.	*Mem.*	*Nun.*	*Pe.*	*Tzadde.*
ך	ם	ן	ף	ץ

Broad Letters

are used in order to fill up the space and make a full line; as a Hebrew word is never divided as in English, so that a portion of it may be in one line and the remainder in another.

Aleph.	*He.*	*Cheth.*	*Lamed.*	*Mem.*	*Tau.*
א	ה	ח	ל	ם	ת

Compositors should strongly mark the difference between the following characters, which have some resemblance in shape:

ב כ *Beth* projects a little at the bottom towards the right hand, but *Caph* is rounded.

ג נ *Gimel* is open at the bottom towards the right hand, but *Nun* is closed.

ד ר *Daleth* projects a little at the top towards the right hand, but *Resh* is rounded.

ה ח ת The left upright stroke of *He* is separated from the horizontal one, but in *Cheth* it is joined to it; while that of *Tau* has a kind of foot.

ז ו ן *Zain* projects a little at the top towards the right hand, but *Vau* is square; while the upright stroke of *Nun final* is longer than either *Zain* or *Vau*.

ט מ *Teth* is open at the top towards the left hand, but *Mem* is open at the bottom.

ם ס The right-hand corner of *Mem final* is square at the bottom, but *Samech* is rounded at that part.

ע צ ץ The tail of *Oin* is sloped towards the left hand, that of *Tzadde* is horizontal, and that of *Tzadde final* is conveyed nearly straight downwards.

Capitals are not used in Hebrew; therefore letters of the same form, but of a larger body, are used at the beginning of chapters and other parts of works in that language.

Vowels.

These points exhibit a system of marks or characters arranged either above, in the middle, or beneath the consonants. Their names, forms, and powers are as follows:

Perfect Vowels.			Imperfect Vowels.		
Name.	*Form.*	*Power.*	*Name.*	*Form.*	*Power.*
Kamets ...	ָ ...	*ā*	Pathakh ...	ַ ...	*ă*
Tsere	ֵ ...	*ē*	Segol ...	ֶ ...	*ĕ*
Long Khirik ...	ִי ...	*ī*	Short Khirik...	ִ ...	*ĭ*
Kholem ...	וֹ ...	*ō*	Kamets Khataph	ָ ...	*ŏ*
Shurek ...	וּ ...	*ū*	Kibbuts ...	ֻ ...	*ŭ*

Sheva and its Compounds.

Sheva and its compounds are pronounced very short, and are never regarded as properly making a syllable, only as beginning or ending it.

Name.	*Form.*	*Power.*	*Name.*	*Form.*	*Power.*
Sheva ...	ְ ...	*ĕ*	Khatef Segol	ֱ ...	*ĕ*
Khatef Pathakh	ֲ ...	*ă*	Khatef Kamets	ֳ ...	*ŏ*

The last three are called the compound Shevas.

Long Khirik (·) is a small point placed before *Iod* (י) which it silences.

Kholem (·) is a small point placed over letters. When put over ו that letter is silenced; but if another point be placed under *Vau* it is not silenced.

Shurek (·) is only placed in *Vau*, and silences it; but if

another point be placed under *Vau*, the dot in וּ denotes DAGESH *forte*.

Short Khirik (ִ) has its place under any letter, but silences none.

POINTS.

DAGESH (ּ) and MAPPIK (ּ) are two points put in the body of certain letters.

DAGESH is either *forte* or *lene*.

DAGESH *forte*: Inscribed in any consonant, preceded and followed by a vowel, or preceded by a vowel and has a *Sheva*, such letters are sounded double. It may have a place in all the letters, except א ה ח ע ר.

DAGESH *lene* has its place only in the letters ב ג ד כ פ ת, and deprives them of their aspiration, but strengthens their pronunciation in some degree.

MAPPIK is placed in the letter ה (He *final*) only, to show that it retains its power as a consonant.

RA-PHE is a small dash (ֿ) that formerly was placed over ב ג ד כ פ ת, when they had no DAGESH, to show that they should be pronounced with *h* aspirate.

MACCAPH is a small dash (־), used to join words together.

ACCENTS.

These are very numerous, and are seldom used in any other than theological and grammatical writings, and only in some books of the Bible, where they stand for notes to sing by, and are called *accentus tonici*; others *accentus distinctivi*, because they distinguish the sense; and others *ministri*, or *servi non-distinctivi*, which show the construction and connection of words. They are placed below and above the line of the consonants. There are twelve found below the line; their names and forms are—

Sulluk	Athnakh	Tiphkha	Do. anterior	Tevir	Yethiv	Munakh	Mahpak	Yerakh	Merca	Double Merca	Darga

There are eighteen placed above the line, as follows:

Keviah	Geresh	Zakefkaton	Zakefgadol	Segolta	Pashta	Shalsheleth	Zarka	Zarka anterior	Pazer	Geresh	Double Geresh	Karnephara	Telishaketanna	Telishagedola	Kadma	Manah superior	Mahpak superior

One mark is found in the same line with the consonants,—namely, Legarme (ǀ); when situated under the line, Pesik (¯).

Another mark is sometimes found over words in the Hebrew contents—namely, Kethiv (°), a small circle, intended to direct attention to a note in the margin or at the foot of the page.

GERMAN

On the whole the use of the German characters (*Fractur*) is declining, and that of the ordinary roman types (*Antiqua*) is being substituted. Nevertheless, it is necessary to give the lay and certain remarks on the composition of works in that language, in order that one may be prepared to set up German when occasion demands it. Formerly these types were laid in one large double case, almost square—that is, nearly as wide as long—but of late years the ordinary roman cases have been adopted, as being more convenient for composing and less awkward when out of use.

The following scheme for lay of *German cases*, fig. 100, is frequently used,[1] and is an exceedingly simple plan to follow.

1	2	3	4	5	6	7							
8	9	0		Ä	Ö	Ü							
A	B	C	D	E	F	G							
H	I	K	L	M	N	O							
P	Q	R	S	T	V	W							
X	Y	Z	U	á	ó	ú	'	]	)				

Upper Case.

!	Hair Spaces	Thin Spaces	Middle Spaces	j	k	e	ä	ö	ü	ſi	ſſ	ß	tz	ck
? / c	b	ch	d				i	ſ	s	f	g		ff / fi	ll / p
ſl / y	l	m	n			h	o	ſt	z	,	w		En Quadrats	Em Quadrats
x / q	v	u	t			Thick Spaces	a	r	; / .	: / -			Quadrats	

Lower Case.

FIG. 100. PLAN OF GERMAN CASES.

On the next page is given the alphabet with the equivalent characters in roman.

[1] Savage's "Dictionary of the Art of Printing" has again been consulted for the suggestions here given.

GERMAN ALPHABET.

Characters.		Signification.		Name.
Capitals.	Small Letters.	Capitals.	Small Letters.	
𝔄	𝔞	A	a	Ah
𝔅	𝔟	B	b	Bey
ℭ	𝔠	C	c	Tsey
𝔇	𝔡	D	d	Dey
𝔈	𝔢	E	e	Ey
𝔉	𝔣	F	f	Ef
𝔊	𝔤	G	g	Gey
ℌ	𝔥	H	h	Hah
ℑ	𝔦	I	i	E
𝔍	𝔧	J	j	Yot
𝔎	𝔨	K	k	Kah
𝔏	𝔩	L	l	El
𝔐	𝔪	M	m	Em
𝔑	𝔫	N	n	En
𝔒	𝔬	O	o	O
𝔓	𝔭	P	p	Pey
𝔔	𝔮	Q	q	Koo
ℜ	𝔯	R	r	Air
𝔖	ſ 𝔰	S	ſ s	Ess
𝔗	𝔱	T	t	Tey
𝔘	𝔲	U	u	Oo
𝔙	𝔳	V	v	Fow
𝔚	𝔴	W	w	Vey
𝔛	𝔵	X	x	Iks
𝔜	𝔶	Y	y	Ypsilon
ℨ	𝔷	Z	z	Tset

In addition to the characters of the preceding alphabet, the Germans make use of three, which are vowels: 𝔄𝔢, 𝔞̈, or 𝔞ͤ, expressed by the Roman character ä, and having the sound of *e* in *where;* 𝔒𝔢, 𝔬̈, or 𝔬ͤ, and in the Roman character ö, which has the sound of *eu* in the French *heure;*

𝔘𝔢, 𝔲̈, or 𝔲̊, having its representative in the Roman ü, and its expression in the thin *u* of the French in *vertu*.

The Germans also make use of the following double letters in printing:

𝔠𝔥	ch	𝔣𝔣𝔦	ffi	ſ𝔦	si	ſ𝔱	st
𝔠𝔨	ck	𝔣𝔩	fl	ſſ	ss	ß	sz
𝔣𝔣	ff	𝔩𝔩	ll	ſſ𝔦	ssi	𝔱𝔷	tz
𝔣𝔦	fi						

In the printed alphabet some letters are apt to be mistaken and confounded one with another. To facilitate the discrimination the difference is here pointed out.

B (𝔅) and V (𝔙). The latter is open in the middle, the former joined across.

C (ℭ) and E (𝔈). 𝔈 has a little horizontal stroke in the middle, projecting to the right, which ℭ has not.

G (𝔊) and S (𝔖). These letters, being both of a round form, are sometimes taken for one another, particularly the 𝔊 for the 𝔖. But 𝔖 has an opening above, 𝔊 is closed, and has besides a perpendicular stroke within.

K (𝔎), N (𝔑), R (ℜ). 𝔎 is rounded at the top, 𝔑 is open in the middle, ℜ is united about the middle.

M (𝔐) and W (𝔚). 𝔐 is open at the bottom, 𝔚 is closed.

b (𝔟) and h (𝔥). 𝔟 is perfectly closed below, 𝔥 is somewhat open, and ends at the bottom, on one side, with a hair stroke.

f (𝔣) and ſ (ſ). 𝔣 has a horizontal line above.

m (𝔪) and w (𝔴). 𝔪 is entirely open at the bottom, 𝔴 is partly closed.

r (𝔯) and x (𝔵). 𝔵 has a little hair stroke below on the left.

v (𝔳) and y (𝔶). 𝔳 is closed, 𝔶 is somewhat open below, and ends with a hair stroke.

As will be seen, here too the ordinary roman cases, upper and lower, are used, fig. 100 and owing to the few accents in demand—the diæresis only being used—the lay can be

easily learned when the characters have been mastered, for one of the great difficulties in composing this language, if from manuscript, is to master the characters in which it is written; these are harder to decipher than the printed form, if the compositor is a novice, and the copy not carefully written. The specimen here given will assist the learner.

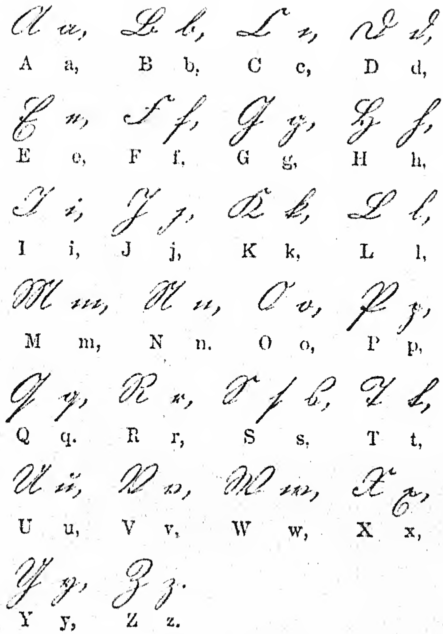


FIG. 101. GERMAN HANDWRITING.

CHAPTER XII

Type Music—Suggested Plan of Cases—Some Specimens of Music Founts which may be obtained.

MUSIC is printed by one of the four following processes: plate, lithography, photo-zinco, and type, the last method being more generally used for book music. The composition requires some amount of practice, as this class of work is almost distinct from ordinary letterpress printing. The cases used are very complicated, and contain more boxes than are usually required for other founts, foreign or otherwise, owing to the very large number of pieces used. The cost, too, of music type is very great as compared with other type, which is attributable to the expense of cutting such a large number of distinct pieces, and also to the smallness of the demand. Firms which make a speciality of music printing are very chary in printing from their type, on account of the great initial outlay, and usually stereotype it first,[1] the quantity of fine lines being liable to a larger amount of wear and tear in printing direct from the type.

The exact details of setting this class of work are very difficult, and perhaps hardly within the scope of this book, but the suggested plan of cases submitted, fig. 102, may be of interest. Nearly every office has a special lay, requiring cases of different make.

[1] The plaster process is preferable for this purpose, the chief reason being that the necessary beating in moulding by the paper process is detrimental to the kerned notes.

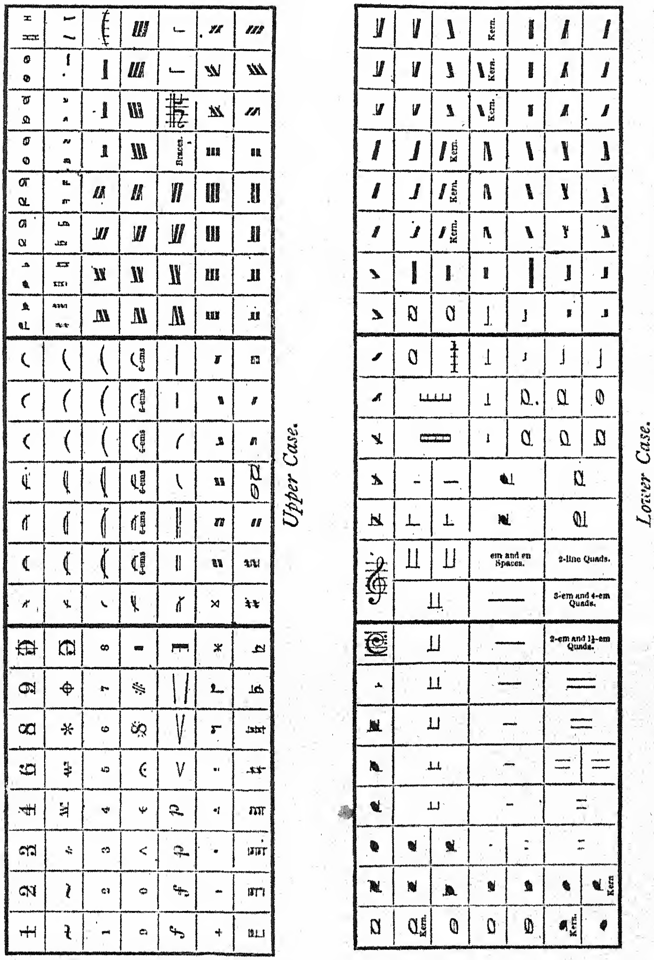


FIG. 102. PLAN OF MUSIC CASES.

Founts of type music are very limited in number; we give a few specimens, fig. 103, of those in general use.

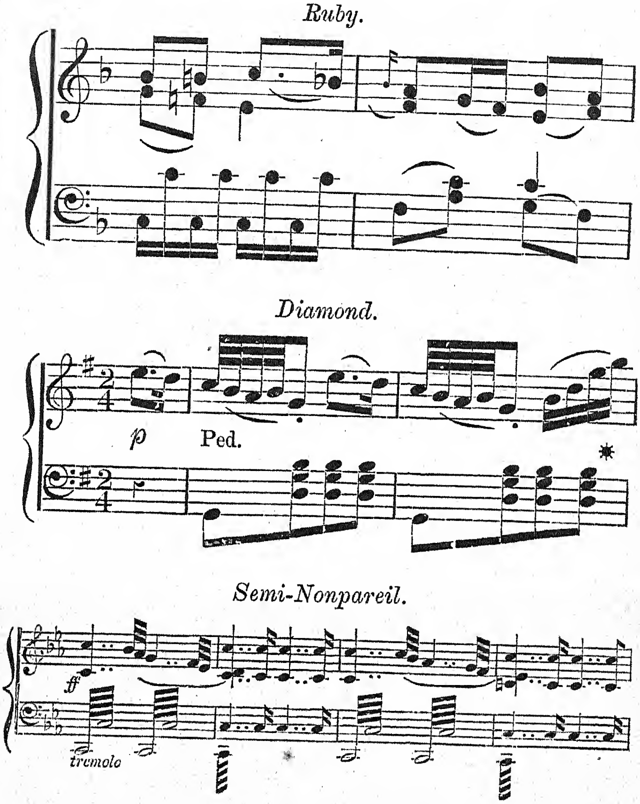


FIG. 103. SPECIMENS OF TYPE MUSIC.

CHAPTER XIII

Table and Tabular Work—Definitions—Composition—Pedigrees.

BOTH *table* and *tabular* work are somewhat difficult classes of composition, and the setting of these, especially table work, requires a good deal of judgement.

Table work is defined as matter in a series of four columns with headings, or five columns or more without headings, and is charged at double prices.

Tabular matter, three columns with headings, and four columns without headings, is charged at half as much again as ordinary composition.

In receiving copy for such work instructions should also be given for the limits of the table. In selecting the type for this the compositor must be guided by the number of lines in his copy for the depth and width of his columns. To settle this he should select the fullest line of each column, and set each in his stick. It is best, supposing the various columns are narrow, to make the measure of each up to ems (or even ens, if imperative) of the fount in which he is composing. This greatly facilitates the justification of each segment. Supposing a small type has to be chosen in order to bring the width within a certain compass, the length must not be lost sight of, or he may experience some difficulty in filling up the page to its proper depth. If this occurs, he can allow the width of the columns to be pinched a little, and sometimes a line can be turned over to make two, if necessary. Should this

plan be followed, the turn-over line would have to be balanced by a white line in each of the other columns, so that the next line of the table may range across in reading.

The headings of the table should be left till the last, and may be set in a smaller type. It is permissible also to set the table oblong, though the shape of the work may be upright or bookwise. The cross-rules used in the columns should be metal ones of the fount in which the table is set, but the column rules should be of brass. Using metal cross-rules for the column greatly simplifies the justification, saving the cutting and dressing of brass rule, which in short lengths is both troublesome and unsatisfactory.

Another class of work is that of *Pedigrees*; this work is also paid for at double the composition price of ordinary matter in the scale of charges. This is owing to the difficult character of the work, and very many of the suggestions given for table matter apply to the setting up of pedigrees in order to approximate the size of the whole. This is particularly important for large ones, often designated as genealogical trees, otherwise the pedigree may assume in the finished state a somewhat unsightly shape.

CHAPTER XIV

Scale of Prices as paid in London—Method of Casting-up Value of Work—Lengths and Widths for ordinary Bookwork—Number of Lines per Thousand—How to Cast-off Copy for Quantity—Equivalent of Leads to Type Bodies—Comparative Sizes of Types—Number of Words in a Square Inch of various Types.

BEFORE closing this section of the work, the *scale of prices* in vogue in London, and the various extras allowed by usage and custom, will be of service. A proportion of the labour in this department of the printing office is still paid for by piecework, whereas in the provinces, where wages are generally lower, the reverse is the rule, and it is generally newspaper hands who are paid by result. The basis of the present scale was formulated about a century ago by a joint committee of employers and men, and the price per thousand has been increased from time to time, the last arrangement, except for some recent and slight alteration as regards casual engagements, being in 1901.

Casting-up.—A *thick space* is reckoned as equivalent to an en in width, and an en to an em in depth. If the number amounts to 500 ens, 1000 is chargeable; but if under 500 ens, they are not reckoned. When the "cast-up" does not amount to threepence, it is not chargeable; but when it amounts to threepence, sixpence is reckoned. Em and en quadrats, or whatever may be used at the beginning or end of lines, are reckoned as an em in the width. Placing notes one shilling for folio, quarto, and octavo; one shilling and

sixpence for 12mo; and two shillings for 16mo, 18mo, and above. Mottoes, quotations, etc., in small type are to be reckoned as notes. Jobs of one sheet and under are paid at ninepence per thousand; nonpareil at tenpence. Appeal Cases are paid at eightpence; and if above forty ems in width, at ninepence. Sidenotes to Appeal Cases are charged as follows: In folio—broad quotations, 3*s.*; double-narrows, 5*s.*; double-broad, 6*s.* In quarto—broad quotations, 4*s.* 6*d.*; double-narrow, 7*s.* 6*d.*; double broad, 9*s.* Chancery Cases are paid according to the Parliamentary Scale at 7*d.* per thousand.

In London compositors on the establishment in Society houses are paid not less than thirty-nine shillings per week of fifty hours. They are restricted, when employed on the piece, from being put on the establishment to do any description of "composition," unless engaged for "a fortnight" at least. If requested, when out of employment, to assist in the "composition" of bookwork or jobbing, they may accept a temporary engagement for not less than two complete days on time, but not of greater length than a fortnight without being entitled to a fortnight's notice, except when specifically engaged for a particular job and retained for that job only, in which case the engagement can be terminated on its completion without notice after two days' employment. Compositors engaged for less than a fortnight are paid at tenpence per hour. Night-work is paid three-pence halfpenny per hour extra, but no charge of less than one shilling is made between the hours of ten p.m. and six a.m. Sunday-work, eightpence per hour extra, from twelve o'clock on Saturday night to eight o'clock on Monday morning, but in no case shall a compositor receive less than three shillings and fourpence extra. Work set up on the piece is not made up by a clicker on the establishment. Corrections are paid at not less than ninepence per hour.

There is one charge per thousand ens for all sizes,

inclusive of Brevier to English; one rate for leaded and various kinds and characters of work. Exhaustive as the scale may be as regards the number of provisions it contains, there are always questions arising, and these are subject to mutual arrangement between master and man.

The following are a few of the intricacies of the scale of prices:

Tabular and *table work* is matter set up in three or more columns depending upon each other and reading across the page. To be paid as follows:

3 columns without headings, one-fourth extra.
3 columns with headings, or 4 columns without, one-half extra.
4 columns with headings, and 5 or more with or without, double the price of common matter.

Headings in smaller type than the body, but not exceeding two removes from it, if not more than 3 lines in depth, to be paid 1*s.* per sheet extra; if more than 3 lines, or if in smaller type than two removes, to be cast up according to the relative values of the two bodies; the greatest number of appearing lines being considered the depth.

Blank tables to be cast up double the price of the text type of the work. No extra charge to be made for headings in smaller type, unless such headings constitute one-half of the table.

The extra price for table, tabular, and column matter to be paid upon its actual dimensions only, with the following exceptions: Title headings to table and tabular matter to be reckoned as part of such matter; but if they exceed 5 ems of the body of the table, etc., in depth, 5 ems only to be charged as table, the remainder as common matter.

Abstract of London Scale, as agreed, 1901.

	Size of Type.		English.	Foreign.	Dictionaries English.	Dictionaries English.	Dictionaries Foreign.	Grammars. English.	Grammars. Foreign.	Catalogues. Library.	Catalogues. Booksellers'.	Catalogues. Auctioneers'.	Greek. Without Accents.	Greek. With Accents.
			d.	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*	*d.*
Manuscript.	English to Brevier	*leaded*	7¼	8¼	8¼	8¾	9¼	8¼	8¾	7¾	8¾	7½	10	11½
		solid	8	9	9	9½	10	9	9½	8½	9½	8	10¾	12¼
	Minion ...	*leaded*	7½	8¾	8½	9	9½	8½	9	8	9	7¾		
		solid	8¼	9½	9¼	9¾	10¼	9¼	9¾	8¾	9¾	8¼		
	Nonpareil	*leaded*	8¼	9½	9¼	9¾	10¼	9¼	9¾	8¾	9¾	8½		
		solid	9	10¼	10	10½	11	10	10½	9½	10½	9		
	Ruby	*leaded*	8¾	10	9¾	10¼	10¾	9¾	10¼	9¼	10¼	9		
		solid	9½	10¾	10½	11	11½	10½	11	10	11	9½		
	Pearl	*leaded*	9¼	10½	10¼	10¾	11¼	10¼	10¾	9¾	10¾	9½		
		solid	10	11¼	11	11½	12	11	11½	10½	11½	10		
	Diamond ..	*leaded*	11¼	12½	12¼	12¾	13¼	12¼	12¾	11¾	12¾	11½		
		solid	12	13¼	13	13½	14	13	13½	12½	13½	12		
Reprint.	English to Brevier	*leaded*	6½	7½	7½	8	8½	7½	8	7	8	6¾	9¼	10¾
		solid	7¼	8¼	8¼	8¾	9¼	8¼	8¾	7¾	8¾	7¼	10	11½
	Minion ...	*leaded*	6¾	8	7¾	8¼	8¾	7¾	8¼	7¼	8¼	7		
		solid	7½	8¾	8½	9	9½	8½	9	8	9	7½		
	Nonpareil	*leaded*	7½	8¾	8½	9	9½	8½	9	8	9	7¾		
		solid	8¼	9½	9¼	9¾	10¼	9¼	9¾	8¾	9¾	8¼		
	Ruby	*leaded*	8	9¼	9	9½	10	9	9½	8½	9½	8¼		
		solid	8¾	10	9¾	10¼	10¾	9¾	10¼	9¼	10¼	8¾		
	Pearl	*leaded*	8½	9¾	9½	10	10½	9½	10	9	10	8¾		
		solid	9¼	10½	10¼	10¾	11¼	10¼	10¾	9¾	10¾	9¼		
	Diamond...	*leaded*	10½	11¾	11½	12	12½	11½	12	11	12	10¾		
		solid	11¼	12½	12¼	12¾	13¼	12¼	12¾	11¾	12¾	11¼		

Reprints not in every respect exact reproductions of the originals, are cast up ¼*d.* per 1000 extra; Reprints with MS. insertions, ½*d.* per 1000 extra.

Stereotyped matter with high spaces is cast up ¼*d.* per 1000 extra; Stereotyped matter with low spaces is cast up ½*d.* per 1000 extra.

Thin founts are cast up ¼*d.* per 1000 extra for every en below 12 ems of their own body.

Bastard founts of one remove are cast up to the depth and width of the two founts.

Pedigrees to be paid double the price of common matter; and the heads and notes upon the same principle as the heads and notes of tables.

Casting-up.—These examples give some idea of the method of arriving at the value of composition per sheet:

(*a*) NONPAREIL (solid), at 9*d.* per 1000.

Number of ems in depth	74			
Number of ens in width	84			
	296			
	592			
	6216			
Number of pages in sheet	24			
	24864			
	12432			
Total number of en quadrats ...	149,184			
at 9*d.* per 1000 ....=		£5	12	0
Placing of notes................................		0	1	6
		£5	13	6

(*b*) LONG PRIMER (solid), at 8*d.* per 1000.

Number of ems in depth	47			
Number of ens in width	54			
	188			
	235			
	2538			
Number of pages in sheet	24			
	10152			
	5076			
Total number of en quadrats ...	60,912			
at 8*d.* per 1000 ....=		2	0	6
Placing of notes................................		0	1	6
		£2	2	0

The process of "casting-up" as here exemplified is the result of multiplication. The number of ems in depth is the multiplicand, and the number of ens in width is the multiplier. The number of pages in a sheet is the compound multiplier, and the total number of ens is the product.

For approximate purposes this scheme is a handy one :

LENGTHS AND WIDTHS OF PAGES FOR ORDINARY BOOK-WORK,

With the number of Ens contained in each page, from Pica to Nonpareil inclusive.

Length.	Width.	SIZE.	Pica.	Small Pica.	L. Primer.	Bourgeois.	Brevier.	Minion.	Nonpareil.
Picas.		*F'cap.*	Ens.	Ens.	Ens.	Ens.	Ens.	Ens.	Ens.
41	30	4to.	2460	3243	3825	4988	5796	6900	9840
32	18	8vo.	1152	1517	1800	2346	2695	3180	4608
28	15	12mo.	840	1088	1295	1680	1978	2350	3360
19	15	16mo.	570	748	888	1134	1334	1600	2280
21	12	18mo.	504	672	780	1020	1184	1400	2016
		Crown.							
48	34	4to.	3264	4290	5040	6693	7696	9120	13056
36	21	8vo.	1512	1968	2340	3060	3520	4200	6048
32	16	12mo.	1024	1369	1600	2116	2401	2809	4096
23	16	16mo.	736	962	1160	1518	1715	2014	2944
23	15	18mo.	690	884	1073	1419	1610	1900	2760
		Demy.							
54	42	4to.	4536	6014	6968	9240	10707	12600	18144
42	24	8vo.	2016	2640	3120	4080	4810	5600	8064
36	19	12mo.	1368	1804	2115	2754	3190	3780	5472
26	20	16mo.	1040	1380	1600	2109	2440	2838	4160
28	16	18mo.	896	1184	1400	1840	2107	2491	3584
21	12	32mo.	504	672	780	1020	1184	1400	2016
		Royal.							
64	48	4to.	6144	8140	9401	12604	14652	17120	24576
48	27	8vo.	2592	3410	4020	5313	6142	7290	10368
40	21	12mo.	1680	2208	2600	3420	3968	4690	6720
29	21	16mo.	1218	1584	1872	2520	2880	3430	4872
32	18	18mo.	1153	1517	1800	2346	2695	3180	4608
24	14	32mo.	672	896	1050	1360	1591	1880	2688

The above figures are subject to the slight variations in founts from different foundries.

Another useful table is the following:

NUMBER OF LINES PER THOUSAND.

No. of Pica Ems in Width.	Pica.	Small Pica.	Long Primer.	Bourgeois.	Brevier.	Minion.	Nonpareil.
10	50	43	40	36	32	29	25
11	45	40	36	32	29	27	23
12	42	36	32	29	27	24	21
13	38	33	30	27	25	23	19
14	36	31	29	25	23	21	18
15	33	29	29	23	22	20	17
16	31	27	25	22	20	19	16
17	29	26	23	21	19	17	15
18	28	24	22	20	18	16	14
19	26	23	21	19	17	15	13
20	25	22	20	18	16	15	13
21	24	21	19	17	15	14	12
22	23	20	18	16	14	13	12
23	22	19	17	15	14	13	11
24	21	18	16	15	13	12	10
25	20	17	16	14	13	12	10
26	19	17	15	14	12	11	10
27	19	16	15	13	12	11	9
28	18	15	14	12	12	11	9
29	17	15	14	12	11	10	9
30	17	14	13	12	11	10	8
31	16	14	13	11	10	10	8
32	16	14	12	11	10	9	8
33	15	13	12	11	10	9	8
34	15	13	12	10	9	9	7
35	14	12	11	10	9	8	7
36	14	12	11	10	9	8	7
37	14	12	11	10	9	8	7
38	13	11	10	9	9	8	7
39	13	11	10	9	8	8	6
40	12	11	10	9	8	7	6

The foregoing table may be used as a means for ascertaining the value per hour of the number of lines contained in solid composition. Should there be any necessary deviation from it as to an increase or decrease in the number given (which may arise from intricate or difficult composition), such deviation must be decided by mutual agreement. When the matter is leaded by the compositor, there is generally a deduction of one line per hour.

Casting-off copy.—An important consideration is that of estimating the number of pages of a required size which any given copy will make. As copy varies so much, especially when in manuscript, a great deal of perseverance is requisite, and although entirely exact rules cannot be laid down, the following may be recommended as the result of experience. After having made up a composing stick to the measure proposed for the width of the work, take an average page of the copy, and set from it until a certain number of lines come out even with a number of lines of type. From this a calculation can easily be made for the whole of the work. Suppose a manuscript of 250 pages, and 31 lines in a page, be given for casting-off, and it is required to determine how many pages it will make in Long Primer, the page being 28 ems wide and 40 lines of type in length; and it is found, by setting up a few lines, that 9 of the copy are equal to 7 of the type. Then:

250 pages manuscript.
31 lines in a page.
250
750
7,750 lines manuscript.

9 : 7,750 : : 7
7
9) 54,250
40) 6,027 lines of type.
151 pages of type.

The number of sheets can be ascertained by dividing 150 by 8, 16, or 24, according to the size of the signature in which the work is to be printed.

The equivalent depth of old type bodies in leads, given here, will be found useful.

PEARL	One four and one eight-to-pica.
RUBY	One four and one six-to-pica.
NONPAREIL	Two fours; three sixes; or four eights.
MINION	One four and two sixes.
BREVIER	Two fours and one eight.
BOURGEOIS	Three eights and two sixes.
LONG PRIMER ...	Three fours; or six eights.
SMALL PICA	Two fours and two sixes.
PICA	Four fours; or six sixes.
ENGLISH	Three fours and two sixes.
GREAT PRIMER...	Four fours and two sixes.

All types on point bodies can be accurately justified with leads, which shows the great advantage of that system.

To assist in casting-off a volume in any particular fount of type the following table will be of value.

Comparative Sizes of Types.—The following table gives the number of lines or ems deep of Miller and Richard's types on old bodies that go respectively to the foot, and also the nearest equivalent bodies on the point system, taking as a basis Pica which has six lines or seventy-two points to the inch.

Old Bodies			*Point Bodies*		
Pica	72	lines	Twelve point...	72	lines
Small Pica ...	83	,,	Eleven ,, ...	78·54	,,
Long Primer ...	89	,,	Ten ,, ...	86·40	,,
Bourgeois ...	102·5	,,	Nine ,, ...	96	,,
Brevier	111	,,	Eight ,, ...	108	,,
Minion	122	,,	Seven ,, ...	123·42	,,
Nonpareil ...	144	,,	Six ,, ...	144	,,
Pearl	178	,,	Five ,, ...	172·80	,,

Example of Use of the Table: A book set in Small Pica (old body), 21 ems (pica) wide, 36 lines to a page, leaded 8-to-pica, occupies 500 pages. If the same book should be set in Brevier solid, 18 ems (pica) wide, 45 lines to the page, how many pages will it occupy?

The proportions are as follows—111 : 83, 45 : 36, 18 : 21. The fact that one book is solid and the other leaded need not be taken into account, as the difference is shown in the number of lines to the page. Therefore, the number of pages required is $500 \times 83 \times 36 \times 21$ divided by $111 \times 45 \times 18 = 349$ pages. *Ans.*

Note: The faces should be of the same series, that is, proportional. If the Small Pica were a condensed letter and the Brevier an extended, the number of pages would be correspondingly enlarged, and *vice versa.*

This table will be found useful in giving a rough and ready idea of the number of words (English language) contained in a square inch of printed matter, leaded and solid, on the old bodies.

	4-lead	*8-lead*	*Solid*
Great Primer	7	7	8
English	10	11	12
Pica	12	14	15
Small Pica	16	19	23
Long Primer	20	24	27
Bourgeois	24	28	32
Brevier	29	33	38
Minion	33	37	44
Nonpareil	40	47	59
Pearl	55	65	81

N.B. All fractions have been omitted.

READING

CHAPTER XV

Qualifications necessary for a Corrector of the Press—Rules for Guidance of the Composing and Reading Departments—The Rudiments of Reading—First-Proof Reading—Reading for Press —The Selection of Reading Boys—Books showing Progress of Work in hand—Reference Works for use.

THIS department is usually recruited from the composing room. If the "corrector of the press" has technical experience, with a certain amount of literary knowledge, so much the better for his success as a reader and for the reputation of the establishment. Further, this person should be gifted with a sharp eye for details—whilst he is looking at one point, say a matter of style, he must not lose sight of his copy. A practical printer is to be preferred by all means to a non-practical man, though there are instances of capable men of the latter class filling responsible positions as printers' readers; but as a rule a compositor, if he has received a fair education and has been noted for clean proofs in type-setting, is the most suitable person. There are so many details and technicalities in printing that it is hardly possible for a non-practical man ever to become thoroughly perfect in picking up deviations of style,—he cannot be expected to know even the elementary principles of composition.

It is essential in all large and well-regulated offices to have a perfect understanding between the composing and

reading departments as regards matters of style, spelling, punctuation, capitals, quotations, authorities, etc. If these are not perfectly understood, they should be printed and circulated. Even then the points laid down may be subject to alteration at the suggestion or order of the customer, who has a right to have his own way to some extent. In cases of this nature, the special instructions should be clearly understood by all concerned.

The rules now appended may serve as some kind of basis for the formulation of a complete set.

Queries as to Style, etc.—In case of any doubt on the starting of new works (manuscript and reprint), instructions as to style to be adopted should be obtained from the Reading Department.

Spacing.—For prose works, if any choice is given in spacing, adopt the wider for leaded and the closer for solid matter. All matter is required to be *fairly* spaced.

Punctuation.—The general rule, in the absence of special instructions, is to adopt a medium style of punctuation rather than a loose or stiff method.

Capitals.—Direct references to any State, King, Queen, or Church, and the words He, Him, My, Mine, Thy, Thine, used in relation to the Deity, to be capitalized.

Broken Words or Lines must always be encircled in proof in the event of an accident in the metal whilst correcting. Picking of sorts from good formes should be prohibited.

Division of Words.—Do not divide words if it can be avoided without sacrificing spacing to any great degree, especially in wide measures. Divisions should, where possible, be on an etymological basis, as in

custom-ary,	short-ened,	triumph-ant,
abs-tract,	assist-ance,	gener-ally.

able, ible, ing, ism, ive, sion, tion, are nearly always safe divisions. Surnames should not be divided, and initials (of Christian names) should be in same line as surname.

Spelling and Compounding of Certain Words.—All eccentricities in spelling should be avoided. The following are a few instances of recognized customs.

Advertise.	Enterprise.	Jailer.
Almanack.	Envelop, *v.*	Judgement.
Ankle.	Envelope, *n.*	Lovable.
Artisan.	Fullness.	Naught.
Ay, *yes.*	Good-bye.	Negotiate.
Aye, *always.*	Good-night.	Net (*price*).
Basin.	Gray.	Nowadays.
By-and-by.	Half-a-dozen.	O, *voc.*
By the bye.	Half an hour.	Oh, *int.*
Calendar.	Historical, an.	Shakespeare.
Cipher.	History, a.	Show.
Connection.	Inclose.	Steadfast.
Debatable.	Inquire.	To-day.
Dryly.	Instill.	Villainous.
Ecstasy.	Intrench.	Wellnigh.
Enroll.	Intrust.	Woeful.

Numbers.—In ordinary works, where numbers are mentioned, put all such in words, but in works of a technical nature, where numbers occur in isolated cases, put all amounts under one hundred in words, above that number in figures. But if the references be many, and all massed together, put all in figures. Definite measurements (feet, inches, yards, etc.) should always be in figures in technical works.

Names of Books and Authorities.—Names of works occurring in text to be roman and quoted; authorities at the end of a run-on extract to be in *italic.*

Authors' names at the end of, say, a poetry extract in text or notes, to be in CAPS and SMALL CAPS.

Foreign Words.—Occasional words in English works to be in *italic* lower-case.

First-proof reading.—In bookwork the rudiments are to see that the size and shape of the selected specimen or book are properly followed. The next step is to verify signature of sheet, headlines, and folios throughout. After the first sheet it is necessary to get the connection from signature to signature by checking the last word of the first sheet and the first word of the subsequent one. It is customary, in finishing the reading of a sheet, supposing there is no more ready, to indicate the ending of this sheet on the copy by a bracket mark [(this side of copy being called the "primer"), at the same time marking the signature and first folio of the next in order on the margin. As the proofs are sent out to the author or publisher it is best to retain this "primer" for reference purposes in reading the next sheet. The length of pages should also be checked, and uniformity preserved as much as possible in all matters of style. The marks and signs used in corrections should be clearly expressed in the margin without being written too large. It is a good plan to draw an imaginary line down the centre of the page by the eye, and write the corrections belonging to the left-hand portion on the left margin, and on the right for the right-hand division of the page. The method of marking the corrections has been shown on page 116, in the section of this work devoted to composition. The proof should never be read to the lad: he should read the copy to you; this is the safest course, though the other plan is occasionally adopted. If time will allow, it is best to skim through the proof beforehand for letterals and matters of style. In altering the make-up of pages, see that your alteration is an improvement, and that it will not make matters worse, either in front or after your proposed change. As far as possible it is desirable that the same reader should have charge of the same work, and also have the opportunity of revising his own first proofs. Particular attention should

be paid to proper names as regards spelling; all dates and authorities should be verified as far as possible, and, if any doubt arises, queries should be marked on the clean proofs sent to the customer. Works of peculiar character or in foreign languages, with which a boy cannot be supposed to be sufficiently acquainted, should be compared with the copy word by word and letter by letter.

Press-proof reading is a responsible duty, and is usually performed by a separate reader—one generally of superior experience and education. In large offices, specialists as regards language and other qualifications are retained, and the work is divided according to the nature of the subject. An elementary knowledge of Latin, French, and Greek is a great acquisition for a first-proof reader, and those more learned in these subjects are sought after as final or press readers.

Selection of reading boys.—Only those with clear voices and good articulation should be engaged. The boy should, without doubt, be fond of reading, otherwise he will find it a very monotonous task. He should have good eyesight, and be able to grasp the meaning of the subject in hand. Further, he should have a natural aptitude for deciphering the many varieties of handwriting which are placed before him.

A work-book should be kept containing ruled pages—one to each work—showing its progress, *i.e.*, first-proof reading, revising, proofs out and returned for author's revise or for press, and, finally, when printed off. Such a volume will be found exceedingly useful.

Works of reference.—One other essential in well-regulated offices is a good library of reference books. Besides dictionaries of various languages, a Whitaker's Almanack, a peerage, and other works of a similar nature, are valuable additions.

HAND-PRESS WORK

CHAPTER XVI

Definition of Press Work—Description of Presses used—The Stanhope, Columbian, and Albion Presses—Instructions for erecting these Presses—Chill of the Albion Press—Sizes of Presses determined by the Platen.

PRESS work is generally understood to mean printing by hand with a flat or platen impression. The men who perform this part in the production of a book are called pressmen. Owing to the increase of mechanical means of printing, the old school of pressmen is fast dying out. Few lads are apprenticed to this department of the business nowadays (although the hand-press forms an admirable groundwork for a printer's education, if not in actual practice most certainly in theory), as the demand for hand labour is somewhat limited, the great improvements in machinery of various classes allowing of really good work being executed by machinery. The small platen machines, propelled by either foot or steam, have also very largely reduced in late years the amount of work done by the hand-presses even after the introduction of the larger printing machines. Notwithstanding this, certain classes of work are still executed by the hand-press, and the exercise of a pressman's calling requires a deal of practice apart from the manual labour bestowed on the printing off. Moreover, it is interesting to keep on record the methods formerly employed in printing by hand.

An ordinary press, with two men working at it, one rolling and the other pulling, is capable of producing only about two hundred and fifty impressions per hour, even when in

full swing, and after all the making-ready has been finished. Small numbers, such as for large-paper editions, and some few works in colours, are usually relegated to this department. The preparatory stages in getting a forme ready to print are more accessible on the press, and a machine is paying best when running; hence the reason for small numbers with frequent making-ready going to the press-room. A pressman's educational qualifications may not always be of

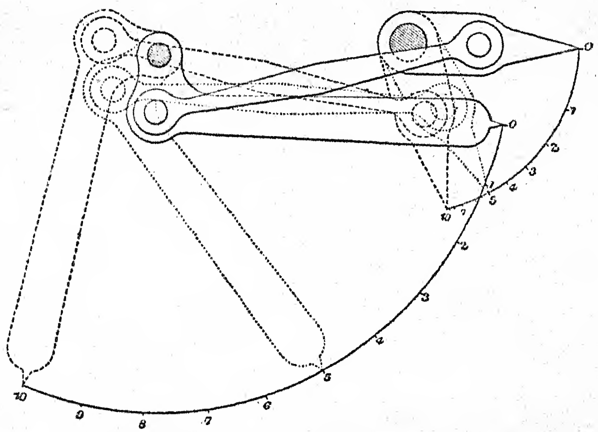


FIG. 104. THE LEVER OF THE STANHOPE PRESS.

the same standard as his fellow worker the compositor, but it is requisite that he should be intelligent, and capable of exercising sound practical sense in the performance of his duties. These essentials are only acquired in a proper manner by long experience, and a good workman can always command constant employment.

The earlier presses were made of wood, and the bed was generally of stone placed in the carriage or, as it is called, the coffin. The first iron press was invented by Earl Stanhope in the beginning of the last century, and became

the basis for the presses now used. The action of the levers employed on this press is shown in fig. 104. Various alterations and improvements were made from time to time; it is only necessary to give particulars of those more generally in use at the present day, viz., the Columbian and the Albion. Formerly pressmen were able to erect and take down their presses, but this is now generally accomplished by the printer's engineers, though it is essential that the men who work them should have a general knowledge of these operations in case of emergency, and we give here a few hints for this purpose on each kind of press in turn.

We will first take the *Columbian* press, fig. 105, as the oldest in make. This press, it is well to mention here, is not so much in use as the Albion, because the latter is better adapted for sizes of double crown and smaller, whilst the Columbian is recommended for larger than double crown, especially as greater strength is to be obtained by that press. Each part of the press has a distinctive name, and the best way to erect it is to follow the suggestions now offered.

Erecting the Columbian press.—Place the feet on the staple in the positions as marked, and raise it upon them; then place the bar-handle in, with the bolt belonging to it; put the principal lever into its place, and then the bolt which connects it to the staple; then the angular or crooked part, which has one square and three round holes, through it, into the mortise, which is in the projecting part of the long side of the staple, and place in the bolt which attaches it to the staple. In the extreme edges of the heads of the two before-mentioned bolts you will observe marks, and corresponding marks over the holes through which they pass; put the bolts in so that these marks meet together and correspond, and so on, until you have all the remaining parts in their respective places. The four screws for the platen, which have heads on one side, are intended to attach

the platen to the piston, which, being put into their proper places, are secured by the four small blocks of iron which accompany them. To increase the power, turn the nut in the rod so as to shorten it, and to decrease it, turn it the

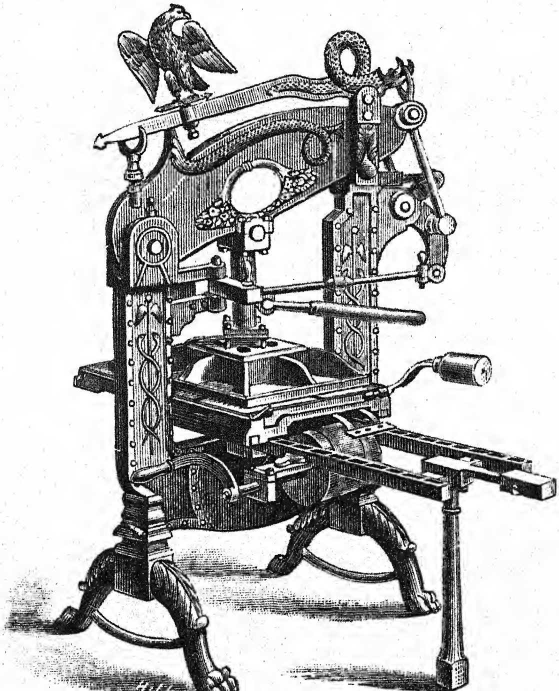


FIG. 105. COLUMBIAN HAND-PRESS.

reverse way. By the nut on the iron screw, which connects the main and top counterpoise levers, the rise and fall of the platen may be regulated, so as to clear the head-bands of the tympans, which is done by screwing the iron nut up as far as is necessary. In adjusting the platen so as to approach the forme exactly parallel, it is necessary, after

hanging on the platen and having a forme on the table, to square it to the tympans, then make a pull, and hold the bar-handle home until some one else screws the four platen bolts to an equal tightness. The small holes which communicate with the different bolts require a small quantity of machine oil occasionally. The impression may be increased by putting thin pieces of tin or sheet iron, cut to the size of the plate of iron which lies between the platen and the piston, secured by the four screws on the top of the platen, and placing it under the piston; it can then be readily seen whether everything is in its proper place, by the perfect ease with which the bar-handle acts.

By comparing these directions with the illustration of the press the different parts may be identified. As will be gathered, the impression is obtained by means of levers, somewhat on the plan of those used by Earl Stanhope in his press. The power is given by the heavy cross-beam at the head of the press, set in motion by pulling the bar-handle across, which acts on the horizontal rod attached, and also brings the elbow into play, great power being thus obtained. The top cross-rod, on which the eagle is placed, is the counter-weight, which falls back into its original position—having been raised in the act of impression—when the recoil of the bar-handle has taken place. These presses were even made as large as double royal.

As before said, the *Albion*, fig. 106, is in more general use, because of its more accelerated movements in printing.

As in the case of the Columbian, each part has its particular name, and the hints given, with those as applied to the erection of the Columbian press, will be sufficient to fix up one of this kind.

Erecting the Albion press.—Place the feet on the staple as marked, and raise it on them; then place the spring and box on the top of the staple, dropping in the long loop bolt, which is connected with it, into the long hole in the staple;

then connect the piston by passing the round bolt through the hole in the staple, and fasten with pin and washer; put the bar-handle in its place with bolt, tightening it so as to

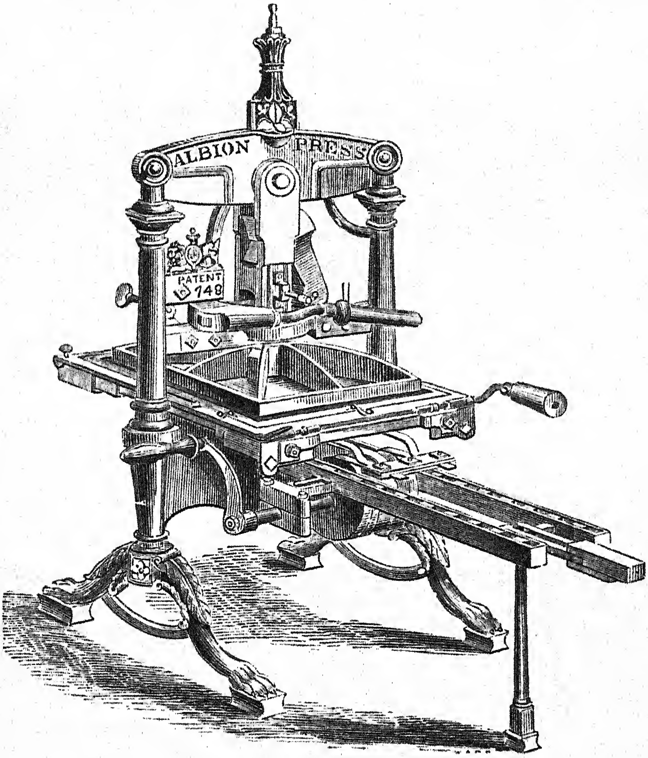


FIG. 106. ALBION HAND-PRESS.

allow the bar-handle to be free; then attach on, with the four screws, the slides or guide-pieces to piston; then put the chill into the piston, also the tumbler or wedge-shaped piece, taking care that the bright or numbered side is towards the bar-handle; then connect the chill with the bolt

in the handle, screw up the nut or top of the spring-box sufficiently to draw back the bar, so as to keep all parts in their places. The wedge and brass guard in front of the piston are intended to regulate the pressure. The other parts of this press may be fixed in the same manner as the Columbian.

These presses are also made in very large sizes. The power is obtained by means of levers, which act on an inclined piece of steel called a chill; by pulling the bar-handle

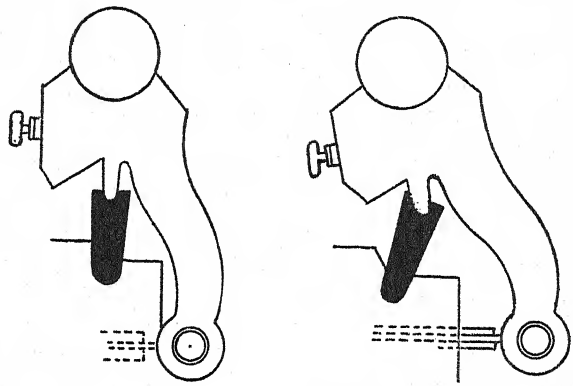


Fig. 107. CHILL IN ACTION. Fig. 108. CHILL OUT OF ACTION.

across, this chill is brought from the sloping into a vertical position at the precise moment of impression. On the bar-handle being allowed to go back to its original position, the chill resumes its former inclination, and the platen is raised from the surface of the type by the recoil of a spring contained in the box at the head of the press; this then allows the forme to be run out, rolled, and run in again for successive impressions, the sheet as printed being first removed, and another laid on its place. The exact position of the chill, figs. 107 and 108, in and out of action, is shown above.

Presses are made in various sizes, although nowadays rarely larger than super-royal or double crown, because the power-press has largely superseded the hand-press. They are classified, commencing with the smaller, as card, quarto, folio, and broadside, corresponding with the different sizes of paper used in printing. The size of platen determines the classification, and the same conditions apply to both kinds of presses mentioned. Card or quarto presses measure something less than the smallest dimensions now given.

Name of Press.	*Size of Platen.*
Foolscap folio	15 × 9¾ inches.
Post ,,	16 × 11 ,,
Demy ,,	18 × 12 ,,
Foolscap broadside	19 × 14¼ ,,
Crown ,,	21 × 16 ,,
Demy ,,	24 × 18 ,,
Royal ,,	26 × 20½ ,,
Super-royal ,,	29 × 21 ,,
Double crown ,,	34 × 22½ ,,
Double demy ,,	36 × 23 ,,
Double royal ,,	40 × 25 ,,

For export purposes, or conveyance to great distances, presses are made of a portable kind, the staple being in two portions, which is an advantage, on account of the weight of this part of the press, but a disadvantage perhaps to its strength.

CHAPTER XVII

Appliances, Tools, and Materials used in connection with Hand-Presses—The Tympan and Frisket—The Bank and Horse—Ink Tables—The Brayer and Slice—Ink Knife and Sheep's-foot.

THE most important adjunct of the press are the *tympans.* They are oblong iron frames, consisting of "inner" and "outer" respectively—the latter is the larger and outside one, as its name implies, and is nearer the type in printing off. When the inner is laid inside the outer the two frames are flush, and are fastened by means of semicircular hooks on the outer, which inclose the studs on the inner tympan. The object of the tympan is, first, to contain a few sheets to receive the impression, and also the making-ready of each forme; when fastened down and turned up to its proper position, the sheet to be printed is laid upon it.

The *frisket* is a light iron frame attached to the upper part of the tympan by means of a knuckle and pins at either corner. Its object is to keep the sheet in its position when turned down over the tympan, and also to prevent the blacking or inking of any part of a forme not to be printed. It is covered with thick paper, an impression of the type is taken on it, and the exact parts to be printed are cut out. It should have been said that the two tympans are nearly always covered with parchment—this material being the most durable and less inclined to become loose or baggy. Cambric, or even silk, is sometimes used for

exceptionally fine work, but of course it does not last long, and is expensive.

To assist the pressman in getting a proper purchase it is customary to have an inclined *wooden stool* fastened to the flooring immediately under that part of the ribs which the bar-handle would be pulled across. To prevent the frisket straining the knuckle-joints attached to the tympan and

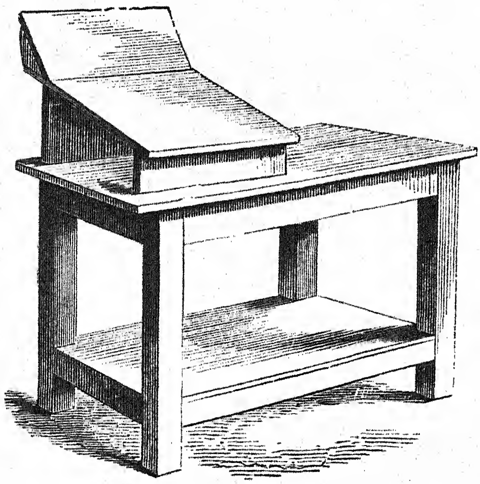


FIG. 109. BANK, WITH HORSE.

falling back too far when "flown," *i.e.*, turned up for the purpose of taking off the sheet just printed, it is necessary to have some kind of stay fastened up to the proper height, to catch the top part of it—this is generally made with a piece of wood fastened from the ceiling.

Several other things are necessary for the outfit of a press, and the next in importance is a *bank*, fig. 109, an oblong deal table, with an undershelf. This shelf is handy for placing waste sheets on, and for holding the different

papers for making-ready or pulling proofs and revises. The addition of a small drawer is to be recommended for holding revises and "colour" sheets. In connection with this bank a wooden *horse* is used, an inclined stage with a sloping back. The paper to be printed is placed on this horse, as is also the heap when the second side is being worked off. As the sheets are printed they are placed on the end of the bank farthest from the horse.

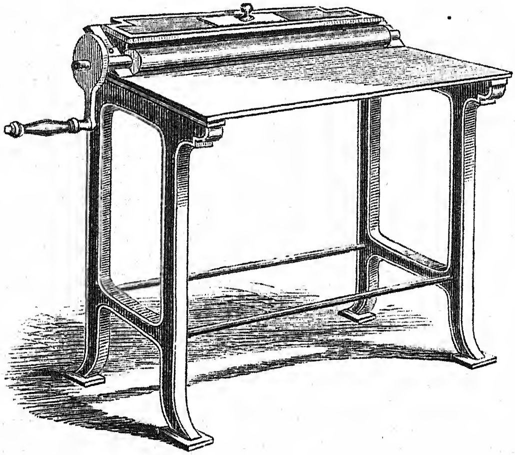


FIG. 110. CYLINDRICAL INK TABLE.

Ink tables are of two kinds, cylindrical and brayer. The best kinds are those made entirely of iron, because they are more solid and firm in standing, but under any circumstances they must be fastened to the floor in the required position, as the suction or lug of the roller is apt to cause them to rock.

The *cylindrical table*, fig. 110, gives out the ink for distribution as necessary when the crank handle is turned, but it need not be turned each time fresh ink is taken, as there

will be sufficient on the cylinder for several distributions if the work is not a heavy one.

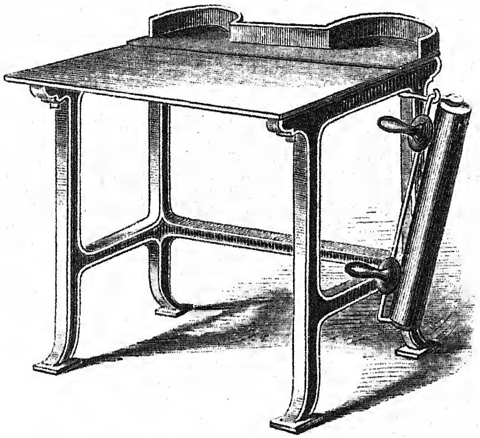


FIG. 111. BRAYER INK TABLE.

The *brayer table*, fig. 111, is used thus: a small quantity of ink is placed loosely on the back of the table, and, with a small wooden implement called a *brayer*, fig. 112, the ink

FIG. 112. INK BRAYER.

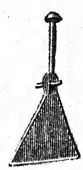


FIG. 113. INK SLICE.

is brayed or rubbed out as required. The ink, as it is taken from the can, should be lifted by the aid of an *ink slice*, fig. 113.

The surfaces of these tables should be planed quite smooth, and also be kept entirely free from dirt or dust. For colour-work iron surfaces must not be used, but slabs

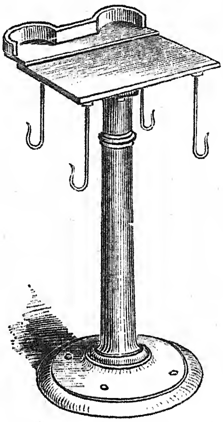


FIG. 114. PEDESTAL INK TABLE.

of either porcelain or marble substituted. These may be fastened down on the planed iron table with thick string or some other contrivance. This will prevent jarring, more especially if a few thicknesses of wrapper paper are placed

FIG. 115. INK KNIFE.

between the two surfaces, and at the same time possibly obviate a fracture of the top slab.

A small table, called a *pedestal table*, fig. 114, is handy for small presses, occupying as it does but little room.

For the mixing of colours a special *knife*, fig. 115, is used. Each press should have, in addition, a *mallet*, *shooting stick*, and *planer*, together with a *hammer* for fastening

the forme on the press; if this latter has a claw it is useful in raising formes on the press. This particular hammer is called a *sheep's-foot*, fig. 116. The pressman

FIG. 116. SHEEP'S-FOOT.

should also be furnished with a sharp pair of scissors and a cutting-out knife, both of which are employed in making-ready.

CHAPTER XVIII

Rollers—Varieties of Hand Rollers used—The old-fashioned Inking Ball—Recipes for Roller Composition—Casting Rollers—Various Hints as to Condition and Treatment of Rollers.

THE *rollers*, fig. 117, used for press work are made of a composition, the principal ingredients being treacle and glue. They revolve on an iron frame provided with two wooden handles. At the two edges of these frames

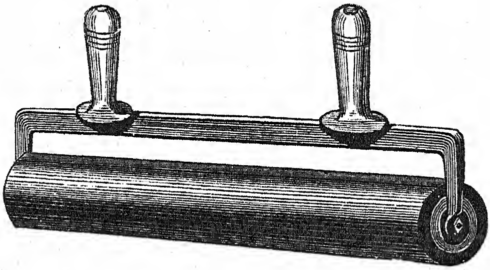


FIG. 117. HAND-PRESS ROLLER.

a point is made, which fits into a metal hollow in the wooden spindle on which the roller composition is clothed. The frame is made in two pieces which overlap, and is fastened by means of collars and nuts so that, when these nuts are undone, the two halves open out and thus allow the old roller to be withdrawn and a new one substituted and refastened up. The cut, fig. 118, shows the frame itself, without the roller.

Rollers are made to any size required, according to the dimensions of the work in hand, such as demy, royal, double crown, etc.

For small work of a jobbing character, a roller with a single handle, fig. 119, is sufficient. We also show the old-fashioned *inking ball*, fig. 120, which was used for beating the surface of the type before rollers were made of composition. These balls are rarely used now, and only for

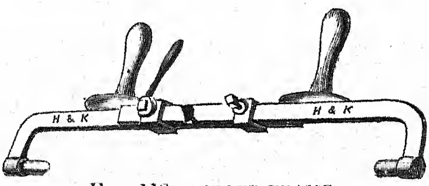


FIG. 118. ROLLER FRAME.

very special purposes. Wood engravers use them sometimes, as they are handier than a roller. The present system of rolling is far preferable to the old one of beating, which was indeed a laborious task, though it is astonishing what

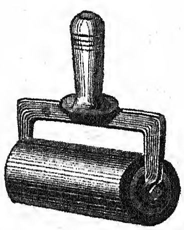


FIG. 119. JOBBING ROLLER.

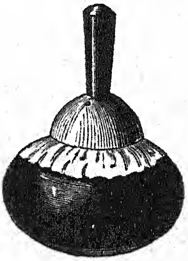


FIG. 120. INKING BALL.

good results were obtained from the inking balls as regards evenness of colour. Without the invention of cast rollers, machinery, with its automatic rolling and inking appliances, would not have made the immense strides it has.

Rollers are made on a large scale, by firms who make the manufacture a feature, by the aid of machinery, solid moulds or tubes being used in all sizes, both in length

and in circumference. They can be had by the single roller or by the contract system—a definite price being charged, so much per quarter, for a given number of rollers to be kept in working order and renewed as frequently as required. This plan is adopted by many large offices in London, as it is found more economical in the long run than to make their own.

However, we propose to show how ordinary rollers may be cast, from various recipes given for different compositions. There are some kinds advertised as patented which have

FIG. 121. ROLLER COMPOSITION KETTLE.

great lasting properties, but the manufacture of these is a trade secret. To be prepared for any contingency that may arise, good serviceable rollers may be prepared from the following—the figures are "parts," and should be calculated by weight:

(*a*) Treacle 12, glue 8, Paris white 1.
(*b*) Glue 10, sugar 10, glycerine 12.
(*c*) Treacle 12, glue 4.

As will be observed, glue and treacle form the principal parts of these rollers. Glycerine and Paris white may be added according to experience and fancy. The success of the

roller depends largely on the quality of the ingredients used, and it is advisable to use only those of the best kind; the glue in particular should be clear in colour, and also break shortly and crisply. The glue, after being broken, should remain in soak till it is rendered soft, and then be placed in the *composition kettle*, fig. 121.

When sufficiently hot and dissolved, the treacle and other ingredients should be added. It is then necessary for the whole to boil for about an hour. Taking, for example, a royal roller for working at hand-press, the mould should be dry and quite clean, warmed, and anointed with oil; this enables the roller to be delivered more easily from the mould.

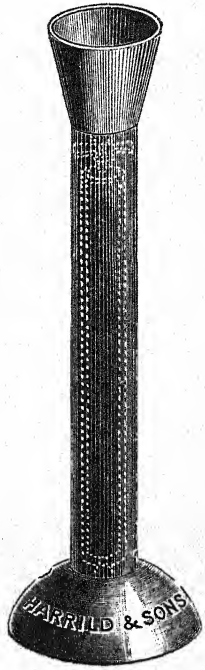


FIG. 122.
SMALL ROLLER MOULD.

For small rollers the *solid mould*, fig. 122, made in one piece, is well adapted. The drawing here given shows the position of the roller inside the mould by the dotted lines. For the larger kind we recommend the moulds made in two sections, as in fig. 123, and, to show the method of closing up, fig. 124 will suffice. The stock must be fastened to the end-piece, and placed in its position in the mould. In order to turn out a good roller, pour the composition in slowly without a break, and in doing so avoid pouring it on the sides of the mould, but rather against the stock. Well fill the mould over and above the length of the stock, and then stand it aside to cool. When removed from the mould the roller should be kept in an even temperature, protected from dust by being placed

in a box or cupboard constructed for the purpose. Before doing this, cut off the superfluous composition at either end of the roller.

Rollers are very subject to the influence of climatic and atmospheric conditions—the least change affects them, and

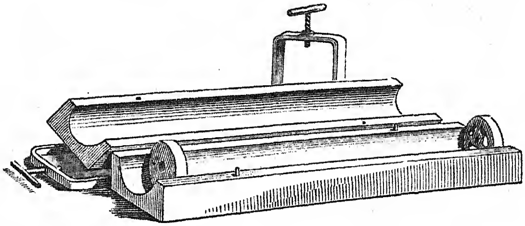


FIG. 123. ROLLER MOULD (OPEN).

they require constant attention. In cold weather they become hard, and in hot weather soft.

They should not be too hard or too soft, neither crack nor skin on the surface, and there should be some amount of

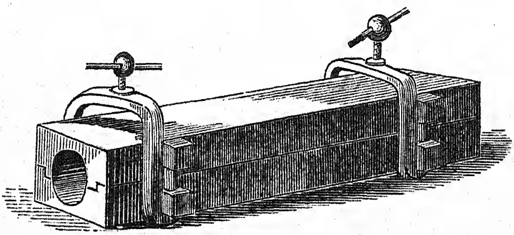


FIG. 124. ROLLER MOULD (CLOSED).

"life" in them, that is to say, there should be a certain amount of "tackiness" when manipulated with the hand. Sometimes they are too fresh or new—"green" being the more familiar technical term; when in this state, they should be put aside to mature. Improper treatment in

washing has very frequently much to do with the bad condition of rollers. Lye should be used sparingly, and only when the roller has been in use some time, in fact, lye would ruin some patent kinds of rollers. For washing rollers used in colour-work benzine or turpentine should be employed.

Many of these suggestions and hints for the manufacture, care, and treatment of rollers will be found useful in emergencies.

To Cast Rollers.—See that the roller-mould is perfectly clean; make a mop and with it oil carefully every part of the interior of the mould. Now turn some attention to the stock; be quite sure that it is perfectly dry, and if the composition is apt to slip off it, bind some string very lightly upon it, then place it in the mould, being very careful that it stands true in the middle; fit on the guide at the top, and fasten the stock down to the mould with string lest it should rise; then warm the mould all over. Meanwhile the composition will have been melting: take care that it does not boil, and stir it about occasionally. Never re-melt old composition without a good proportion of new, and if the old is very hard, then add some treacle. It is best to use one of the special kettles sold by the printer's furnishers, as otherwise there may be some difficulty in getting the composition to melt properly. When it is quite melted, carefully pour it into the mould, filling it to the level of an inch or two higher than the end of the stock to allow for shrinkage. Let it stand for about twelve hours; then prepare to draw the roller out of the mould. If it will not come readily, one person must hold the stock and another the mould, and both must pull without jerking in opposite directions. Pushing upon the lower end of the roller may perhaps be necessary also, but if the mould has been properly oiled there ought not to be much difficulty in drawing it. When out, trim the ends, and hang it up in a dry, cool place for a day or two before using.

Lubricating Roller Moulds.—Sperm and lard oils are the best. If properly used, no trouble will be experienced in drawing the rollers.

Facts about Rollers.—The setting of a roller, especially on a cylinder machine, requires care and judgement. Rollers cast from re-casting composition never shrink. The roller trucks should be one-sixteenth of an inch less in diameter than the roller. Glue and molasses rollers should be kept in an air-tight box with a shallow jar at the bottom for water as needed. In damp weather remove the water, in dry weather let it remain. Rollers when out of use for any length of time should be put away with the ink on them to protect their surface from the action of the atmosphere. Several things enter into the choice of composition, such as quality of ink used, climate, class of work, requirements of presses, besides other details. The cores should be cleansed by scraping, or, if of wood, by scalding in strong lye or soapsuds, and then dried. New rollers should be washed in sperm or coal oil before use; it will prevent the strong suction. Turpentine is better than benzine for removing coloured inks. Never use lye on new rollers.

Treatment of Old Rollers.—When rollers have been lying for weeks with a coating of ink dried on to the surface—a circumstance which frequently occurs, more especially when coloured inks have been used—get an ordinary red paving brick (an old one with the edges worn away will be the best), place the roller on a board, then dip the brick in a trough of cold water and work it gently to and fro on the surface from end to end, taking care to apply plenty of water, dipping the brick in repeatedly, and in a short time the ink will disappear. Nor is this all; because, if care and patience be exercised, this treatment will put a new face to the roller, making it almost equal to new; the coating of ink having, by keeping the air from the surface, tended to preserve the roller from perishing. Lastly, sponge off clean.

Good Wearing Rollers.—It is said that rollers made from Chinese sugar-cane molasses are far superior to those made from any other kind. The syrup will bear long boiling without granulation, and when cast into a roller is much tougher, more elastic, and has more suction or tack than those made with the material in common use.

Rollers out of Use.—Rollers put away in an upright position, and allowed to remain idle for a week or longer, are observed to have a smaller circumference near the ends than at the middle. To avoid this it is suggested that the rollers should be placed in boxes lying lengthwise, with a bearing at both ends in the sockets provided for the purpose.

Arched Rollers.—The arching of a roller is generally caused by the roller becoming dried or hard. When this takes place, and the outside edges bear off the centre of the roller, cut a strip of the composition off each end with a sharp knife.

Flaring a Roller.—This operation is both dangerous to the roller and sometimes unsatisfactory in its results, but nevertheless we give particulars how to proceed with it, as it is a very favourite device with some pressmen, especially in small offices. It is as follows: Take a sheet or two of waste printing paper, make it up into a loose torch, and when lighted flare the roller all over, just sufficient to add a new face to it without melting the composition. This plan will, if successfully executed, close up the fissures caused through being cut by brass rule.

Washing Rollers.—Rollers must not be washed with lye until they are beginning to wear somewhat. Smothering in common ink and scraping are recommended in preference. Old enamel-faced rollers may be washed with turpentine to great advantage, as it makes them sticky, which produces a slight temporary suction in the roller. Washing with turpentine will soon spoil a good roller, the stickiness produced becoming a dryer or coating on the face of the roller.

Cooling Rollers.—As ice-chests are now very common, it may be well to warn the printer on no account to put a roller in such a receptacle, or it will soon become frost-bitten and utterly useless. It might be thought, when the roller is almost separating from the stock in hot weather, that almost any mode of cooling it would be desirable. The sudden chill to the surface is, however, quite enough to spoil the roller before the cold has time to penetrate sufficiently deep to harden it. If unworkable, owing to the excessive heat of the atmosphere, hang the roller all night in a cool, dry cellar, or in any cool place where a good current of air can get to it. If it is a small roller, swing it well to and fro for a time before using it.

Warming Rollers.—If rollers have become too cold, place them in warm rooms, not near the fire, until they recover themselves. When they begin to work, place a candle or gas jet under the ink table—if an iron one, the flame about a foot below the iron—and occasionally vary the position of the light. The table must not be made hot, and the heat applied must be imperceptibly small, as the object is only to remove dampness and the rigidity of the cold.

Damp or Greasy Rollers.—These may be known by their printing a dull, dirty gray instead of a proper black. If new, wash them in turpentine; if old, in lye. A far better plan is to smother them in common ink-scrape, and sheet them; this is nearly always effectual. If a damp roller does not recover with this treatment, it should be hung up in a warm room until it revives.

Cracked or Cut Rollers.—Caution is necessary in using a cut or cracked roller for colour-work, as the old black ink may ooze out of some of the apertures. When working at press always cut round those parts of the roller-handles which rest upon the ink table before commencing colour-work, or the black ink which adheres to them will get on to the slab and deteriorate the colour.

To Dry or Warm a Roller at Short Notice.—Hold it a few feet from a moderate fire and keep turning the roller on its axle for five minutes. Or, take some sheets of waste paper and make them as hot as you can, wrapping the roller in them, one after the other. If a new roller be required from a roller-maker, always send a blanket to wrap it in. If rollers are to be sent by train, they should be suspended in a box.

Too New Rollers.—Coat the roller by distribution with balsam of capivi and let it hang for two hours; after which, scrape it. This evil-smelling drug is also very useful if mixed with black or coloured inks when they do not work satisfactorily.

Preserving Rollers.—A simple process for preserving and renovating ink rollers, and adding greatly to their longevity, is as follows: A steam jacket is added to the roller closet, and numerous fine jets are so arranged as to play gently upon the rollers within. These jets thoroughly cleanse the surface of the roller, the skin on its face disappears, the body of the roller absorbs a portion of the heated vapour, and the whole is kept in a fresh, elastic condition, ready for work without further preparation. Experiments by practical men seem to show that the contrivance possesses considerable value, and is likely to prove very economical in large printing establishments.

To Keep Rollers.—In Germany the following preservative of rollers when not in use is often applied: Corrosive sublimate, 1 drachm, fine table salt, 2 oz., are put together in half a gallon of soft water. The mixture is then allowed to stand twenty-four hours, and must be well shaken before using. It is applied with a sponge after washing.

CHAPTER XIX

Inks—The Management of Inks—Description of various Kinds and Properties of Good Inks for different Purposes—Recipe for Black Ink—Mixing of Coloured Inks.

THE *ink* used for printing purposes is generally manufactured, as is the case with rollers, mainly by outside persons, and the printer is relieved of the trouble of making his own. Perhaps this is for the best, for the firms which make it their business are better able to give it their entire attention, and, further, it is produced under the care of responsible persons with some chemical knowledge.

Ink is a substance consisting of varnish, with an added colouring matter. Taking black ink as an example, this varnish is generally composed of the best linseed oil, boiled, with the addition of some resin, and occasionally soap—the colouring being obtained by means of lampblack, which should be of the best kind, some makers intensifying the depth by a little indigo or Prussian blue.

The management of inks seems to be little understood by many printers. Printing ink is substantially a paint triturated to extreme fineness. There are occasions, of course, when the least amount of colour which can thus be put on is sufficient, but it usually needs more, and especially for handbills and posters. The first requisite in this case is that they shall catch the eye quickly, which cannot be done by hair-line faces or small quantities of ink. They should be charged with colour. Principal lines should have more

impression than weaker ones; this is generally better accomplished by underlays than overlays, for not only is the impression stronger, but the line will thus take more ink. The more slowly the impression is made the blacker the line will appear, as the ink has then time to penetrate. It is well sometimes, when extra solidity of colour is required, to run a good piece of work through a second time. House-painters do not finish a house at once, but lay on one coat after another until the requisite intensity of colour is obtained. Especially should this precaution be followed for pale or weak colours, such as the various yellows. One great reason why this hue is hardly ever used by printers, except through bronzing, is that it always looks pale and ineffective on paper, and is lost in artificial light. The colour, in its various modifications with red and black, is very effective, as can be seen by looking at the leaves of trees in autumn, which are compounds of green, brown, red, and yellow, the first soon disappearing, and brown being the last to go.

Inks of various qualities, and for different purposes, can be obtained. What will suit one class of work is not always adapted for others. Broadsides require a thinner kind of ink, which need not be expensive. Bookwork should be printed with a good quality of ink, and, further, the conditions under which it has to be applied must be taken into consideration. Hand-presses require a stiffer character of ink, whereas machine printing demands a softer kind, that will distribute more easily, and this too depends on the rate of production of the machine. Jobbing inks, of a quick-drying character, are necessary for the speedy turning out of such orders. Illustrations, too, have a special make, designated "cut" ink, which is higher in price. Many improvements have been made in the manufacture of ink from time to time, which have tended very greatly to reduce the price, but the printer is strongly urged not to use a cheap article for good work, if he is desirous of his work retaining a permanent colour. Select an ink which

will work clean, and one which is a good black, neither blue nor brown in shade. This can be better seen in the printing of large type, where there is a larger mass of ink. Some inks have a tendency to turn brown in drying, and this should be carefully watched. The drying properties should be noticed—offset, after a reasonable time, being as great an objection as too quick-drying, when used for bookwork. The paper to be used must also be considered, whether wet or dry. Ink which is used on dry paper must be naturally more rapid in its action, and a smaller quantity is required in printing on such papers; on the other hand, dampened papers require more ink and need not be so quick-drying, for the drying of the paper absorbs the ink. Coloured inks are most difficult to manufacture, and necessitate very great care in working. The colours should be well ground and mixed, and varnish of only the very best quality used. Lighter colours are usually more easy to print, but some dark colours are more difficult to work than others of a darker hue.

Savage, in his book "On the Preparation of Printing Ink," 1832, gives a recipe for a good black ink for ordinary work:

Balsam of capivi	9 oz.
Best lampblack	3 ,,
Indigo *or* Prussian blue . .	$1\frac{1}{4}$,,
India red	$\frac{3}{4}$,,
Turpentine dry soap . . .	3 ,,

This makes a total of 17 oz., the whole to be well ground.

For the grinding of ink, *mills*, fig. 125, are made, but for small quantities the slab and muller may be used. Under any circumstances, the latter articles should be kept if the printer desires to fall back on his own resources for coloured inks. For this purpose, too, the prepared varnish must be obtained, and an assortment of dry colours kept in stock for immediate requirements.

In the making of coloured inks cleanliness and thorough grinding and mixing are absolutely necessary. Avoid adding white for reducing colour, as it takes away the brightness —this especially refers to the light shades of colours. The

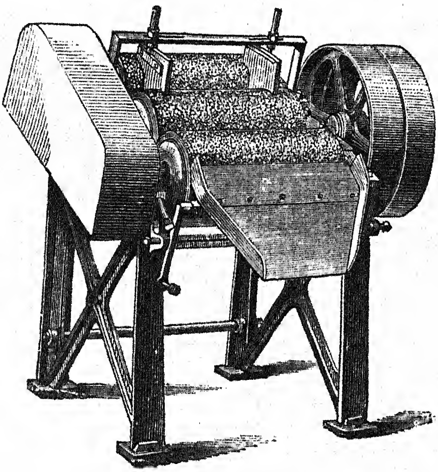


FIG. 125. INK GRINDING MILL.

addition of a little curd soap prevents the ink clogging the face of the type, and also reduces the tendency of the top part of the ink to "skin" when in the can.

As a general rule ink should be tampered with as little as possible, for any doctoring of the pigment has a deteriorating effect which may ultimately affect its colour or shade.

CHAPTER XX

Printing by Hand-presses—Method of covering Tympans—Fixing Forme on Press and Making-ready—Cutting the Frisket out—Obtaining Register—Fixing the Points—Even Colour in Working off—Lubricating the Press—Difficulties due to Change of Temperature—Set-off—Slurring—The Cleansing of Type.

HAVING obtained a knowledge of the presses generally in use, and acquired some ideas on the subjects of rollers and inks, the learner may proceed to commence operations by covering the *tympans*, both inner and outer.

Each skin of parchment should be selected some two or three inches larger than the frame of the tympan for which it is required. It should be uniform in substance as far as possible, and quite free from holes and other blemishes. Lay one of the skins on a table, or bank, if wide enough, and place the frame on it as near the centre as possible, thus leaving an equal margin all round for turning in or lapping over. The best surface of the parchment should be turned to the side which will be nearest the forme, supposing it is the outer tympan which is being dealt with first. If this be the case, holes must be cut in the margin to allow of the tympan hooks being placed through, and a piece taken out of the four corners to allow of a neat turning over without being bulky or clumsy. The point-grooves in the frame must be left open, so that the points may be fastened in any position. When the shape has been cut out, raise the frame, and well paste it, first seeing that it is perfectly clean, and

that all old paste and parchment is removed from it. After this, well paste the outer edge of the parchment that has to be turned over the frame. When this has been done, put it into position again, and commence turning over the parchment, and tuck in with a folding-stick. In doing this care must be taken that it is not pulled or stretched too much in any particular direction, but put on squarely and equally. The edges of the four sides of parchment should be wrapped well round and underneath the frame, first seeing before pasting that the superfluous margin is not too much for this purpose. The covering of the inner tympan, being less complicated in its shape, is a much more simple task, and therefore better for the learner to begin with. After the paste has dried, the parchments may be sponged with clear water, and allowed to dry. When completed, the two parchments should be perfectly tight, as a drumhead would be.

The next operations are successively fastening the forme on the press and making-ready for printing. This last expression embraces the most important point in the art of printing, as distinct from composition. Without proper making-ready all efforts are thrown away, and therefore it is essential that the utmost pains be taken in the execution of this part of the business. Roughly, making-ready is bringing up the type to an absolute level by patching up certain sheets, as explained later on, and making the pages register in the backing or perfecting of the sheet in printing. If type is new it should be fairly level; not much trouble will be experienced, and a few sheets only would be required between the tympans. If a fount is somewhat worn, it requires more time and patience in bringing up to a proper level; in this case more sheets are required in the tympans, or a blanket of flannel, felt, or rubber may be used. The inequalities of type are counteracted by using thin paper, cutting it away where the impression is high, and where low adding a piece the required shape by pasting.

Practically speaking, if the type were new and absolutely true, and the platen and forme carriage equally parallel, little or no making-ready would be required; but, as a matter of fact, this is an ideal never realized.

Fastening the forme on the press.—The type surface should be placed in the centre of the press exactly, and the chase fastened to the corner-pieces of the bed with furniture and quoins. If by chance the forme has to be lifted for any purpose after fastening down, the exact position should be marked on the press with a pencil before lifting. When the forme or chase is a small one, it may be fastened by furniture stuck down with a piece of melted roller composition, the glue contained in this acting as the adhesive power. This, however, is not a reliable method for heavy formes, even if they be small, and an outer chase should be used as a fill-up. Better still, use one of the special chases now made with movable bars at either end, which fit into slots as shown in an early part of this work; this enables the pressman to secure his forme with a minimum amount of trouble, and with absolute certainty.

Making-ready.—After all is fast, a few sheets, say six or eight of very thin double crown, about 11 lb. or its equivalent in other sizes, should be placed in the tympan to take off the hardness of the impression. Supposing the impression of the press is somewhat set to a type forme, a proof may be pulled for final revision by the reader. At the same time, if the forme is the first one of a new work, a proof should be taken on its own paper, laid as carefully as possible in the centre, in order that the margins made may be duly certified as correct. These two things done, the pressman may proceed to pull his impression sheet without ink. Before lifting the tympan up two holes should be pricked with a pin or needle right through the tympans at both ends, in order that when this sheet has been patched up (*i.e.*, made level), it can be placed between the tympans

in its exact position by means of the corresponding holes, pasting it at the four corners to prevent shifting. After the impression sheet has been pulled, it should be taken to a well-lighted place and turned face downwards on an inclined board. By choosing a good light the impression made can be seen by a side glance. Where the type stands high it should be cut away, and where low it should be patched up with the very thin set-off paper—corners and pieces of this paper being torn off to the required shape and pasted on the parts which do not come up well—thus equalizing those parts which originally stood respectively high and low. When this is done, it can be placed in its position as before explained, and a second and third sheet, if necessary, pulled in the same manner and examined, till the whole forme has been well brought-up. Before pulling the first sheet, it should have been said that if the forme is not a solid one, that is, if any of the outer sides of the type are short or entirely blank, the absence of printing surface must be compensated for by the substitution of a bearer in the shape of anything type-high—a metal clump for preference. If possible, this bearer should be so placed that it will not be impressed on the paper, otherwise it would leave an ugly mark which would not come out in pressing the sheets afterwards. It should be placed just beyond the extreme edge of the paper opposite to the short or blank page; this plan obviates any possible hardness of impression on that part of the printed sheet. This bearer can either be fastened with the locking-up materials which hold the forme to the press or stuck down with melted roller composition.

Cutting the frisket.—After the impression has been levelled, this may be dealt with next. To prepare for it, it is best, in the first place, to paste the frisket frame all over with stout brown paper, and lay it aside to dry whilst patching up the impression sheets. The frisket being dry can then be fastened to the tympan with the pins supplied for that

purpose, the forme inked lightly, and the frisket and tympan turned down over the forme. A light pull should be taken, or, as some workmen prefer, the whole forme beaten gently but firmly with the palms of the hands. This indicates the exact position of the type to be printed. The frisket should then be unfastened and taken off, and all the parts to be printed cut out with a sharp knife or pair

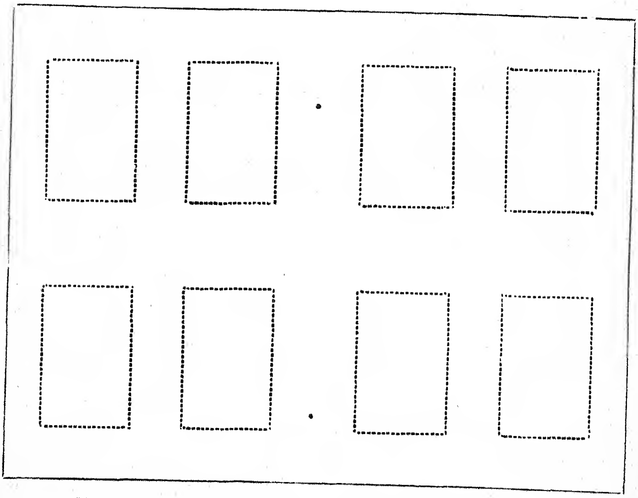


FIG. 126. OCTAVO SHEET, SHOWING POINT-HOLES.

of scissors, care being taken that all the printing surface is eliminated from the frisket, otherwise any superfluous frisket sheet will cause a "bite," or non-printing of the portion which should be printed. This being satisfactorily executed, the frisket can then be re-fastened on.

Fixing the points.—The next operation is to secure proper *register* on the second side of the sheet, whether it be half-sheet or whole-sheet work. Assuming it is an octavo which

is on the press before us, the point-holes would fall as indicated by the dots in fig. 126, the points being screwed in the grooves by means of the *point-screws*, fig. 127.

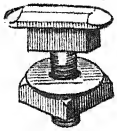


FIG. 127.
POINT SCREW.

These *points* are made of two kinds, spring and ordinary. The former are adapted for assisting in throwing the sheet partly off when impressed, which is a help to the pressman. They are also made in different patterns, according to the size of the work in hand. An octavo is that shown by fig. 128, and a twelvemo *point* (with an elbow), fig. 129, both with a spring attached. The ordinary ones are the same shape precisely, only without the spring tongue. In addition to these points there are others, amongst them the *paste points*, used for obtaining particularly fine or close register; sometimes four of them are used. These are pasted in between the two tympans—the point or spur protruding through the outer parchment; frequently drawing-pins are used for the purpose, but care must be taken that they are firmly secured, or all the labour involved in fixing them in position will be thrown away. These points, when they fall in the middle of the sheet, and in a corresponding position to the cross-bar, where one is used in the chase, must fall in the grooves, fig. 130, in the centre of the short bar, otherwise the spurs will be smashed at the first pull taken. It will be observed on the diagram given of the sheet showing the point-holes, fig. 126, that the off-side one is somewhat nearer the centre than the near-side one; this is merely to obviate the necessity of the pressman reaching

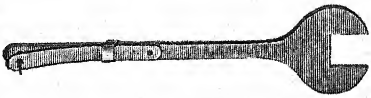


FIG. 128. OCTAVO POINT.

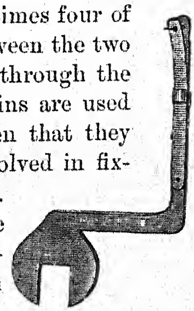


FIG. 129.
TWELVEMO POINT.

over so far in pointing the second side of the sheet. Another reason is that a sheet already printed one side and turned round by accident is easily detected.

Making register.—The sole object of points is to obtain perfect registration of the pages in backing, or printing the second side or "reiteration" of the sheet, as it is called. To arrive at this, supposing the forme is correct as regards its furniture and straight-edging, the points must be placed in the dead centre of the sheet. Pull an inked proof, and

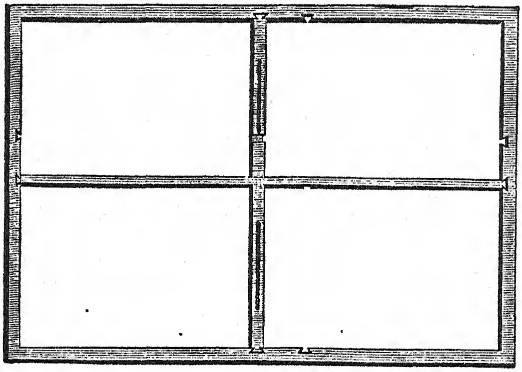


FIG. 130. CHASE SHOWING GROOVES FOR POINTS.

then turn the sheet from top to bottom, and not from near-side to off-side, as would be done in the case of a twelvemo. Half-sheet register should be made, even in sheet-work; at any rate for the first forme: this ensures more perfect register. This having been done, the sheet should be held up and examined page by page, to see what is the result of register. If the pages do not fit in with each other correctly, the reason must be found out. Two causes may be responsible for it: first, that the furniture has not been gauged up truly, or the pages not straight-edged properly; second, that the points have not been put on in the centre or squarely.

If the fault is due to the latter, the point on the side in which it is out must be gently tapped in the direction required to make better register. If the furniture is the cause of the imperfect backing, the forme must be unlocked and altered as necessary, and for this purpose scaleboard should always be placed in the crosses of the formes in making-up or gauging the furnitures for press, this allowing of any slight alteration in margin being easily made. The bringing-up, register, and frisket completed, any possible slurs should be obviated by corks being stuck down on the forme at intervals, and likewise on the frisket, between the pages. These pieces of cork should be cut into slices, and when fastened down on the furniture should be sufficiently thick to be a shade higher than the type. They act as bearers to the paper only, and, in the case of any bagging of the tympan or frisket, prevent the sheet from sagging and keep it flat. Corks on the forme, placed judiciously, also prevent the roller from jumping or wiping on the extreme edges of the pages. It is a good plan to have these corks so arranged both on the near-side and off-side portions of the forme, in addition to being placed at the end of each space caused by the gutter or back margins, otherwise the roller will drop, in rolling across, between the line of pages, and deposit an objectionable excess of ink at the edge of the page. After these details have been carried out, and the revise signed, the necessary paper should be obtained from the warehouseman; the ink table may then be put into condition for working, and the colour-sheet approved.

Uniformity of colour in working is a matter of very great importance, and to maintain this it is necessary to have proper and equal distribution of ink. In braying-out the ink do not spread it out too far over the table, or else little room will be left for proper distribution. Take little and often, rather than large portions for braying-out, adding to the roller from time to time. Good press work should be

free from "monks" and "friars." The former are black and dirty patches in any portion of a sheet, and the latter are rotten, or pale, parts in any page. To give a good and even colour, take fresh ink and distribute well, and then reverse the roller and redistribute before taking another supply of ink, each of these actions being separately taken in rotation as the sheets are printed one by one. If the forme is a light one, the reversing of the roller and redistribution can be repeated before taking fresh ink. Experience will soon teach the pressman when to take more colour, but regularity in these details will insure greater evenness. These remarks are to be impressed on the learner, and cannot be too often dwelt on. If regularity is observed, and the roller is kept on the move continuously, being sometimes reversed, the difficulty will be greatly reduced; especially if the forme, too, is rolled equally each time. Always commence and finish rolling on the near-side. Cleanliness is important, therefore the forme, roller, and ink table should all be absolutely clean. The colour-sheet should be kept well in sight for the first side of the printing. This done, the sheet can be laid aside for the time. In checking the colour of the second side or forme, the side first printed can be turned up occasionally for comparison. Having got the roller in order and the paper ready, the lay of the sheet for the first side should be determined by halving the margin exactly, both at top and bottom, and also the two sides of the paper. This lay is made by sticking pins in the tympan obliquely, two for the off-side and one for the foot. After the first side has been printed, these pins should be removed and the second side laid on the spurs by the point-holes made in the sheet by the first impression.

In bookwork it is customary for two men to work as partners, each taking it in turn to roll and to pull. It is the duty of the one rolling to straighten the sheets as laid off, and to keep a look-out for any deviation of colour, or other

defects. The man pulling is fully occupied in laying on, pulling, and taking off the sheets as printed, preparatory to repeating the same operations for each sheet.

Lubricating the press.—For the proper and easy running of the press it should be kept well oiled. The *lubricant* should not be applied too freely, otherwise the press is likely to become very dirty, apart from the waste occasioned by an excess. Lard oil is a good lubricant, though difficult to keep liquid in cold weather.

Extremes of weather occasion difficulties in the press-room, through their effect on the rollers and ink. Rollers, as before mentioned, get hard or soft according to temperature, and a few hints on this subject have already been given. Ink, too, is difficult to distribute in cold weather, the inking surfaces refusing to take kindly to the ink when chilled. A gas jet attached to a flexible tube may be lighted and placed under the table for a few moments, in order to bring it up to a normal condition. Printing offices are nowadays much improved with regard to more equal temperature, but in olden times it was a frequent occurrence for the pressmen to be "frozen out" (*vide* Moxon).

Off-set and Slurring.—These are two other matters which should be watched for. The first is caused by the off-set of the ink of the first side in printing the second, if it has not had sufficient time to dry, and the difficulty is great where the forme is a heavy one and the type carries a deal of ink. To prevent this it is necessary to change occasionally the thin set-off sheets pasted by the four corners on the tympan. Oiled sheets are sometimes used for this purpose; home-made ones may be manufactured by washing them over with turpentine—this obviates the necessity of changing frequently. The following suggestions may also be of service:

When the forme has been printed the sheets should be counted before lifting it off the press, in case of "shorts"

in the paper, or spoilages. Printers' reams are made up to 516 sheets; this allowance is ample for "overs" and a reasonable amount of spoilage or waste, unless it is for ex-

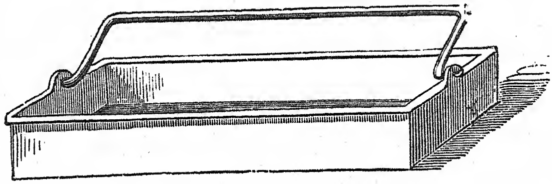


FIG. 131. PORTABLE LYE JAR.

ceptional work. For smaller numbers the proportions of the overs to a perfect ream should be thrown in; thus, for 250 of sheet-work 258 sheets should be given out.

Set-off Papers.—Paper saturated with benzine is as good

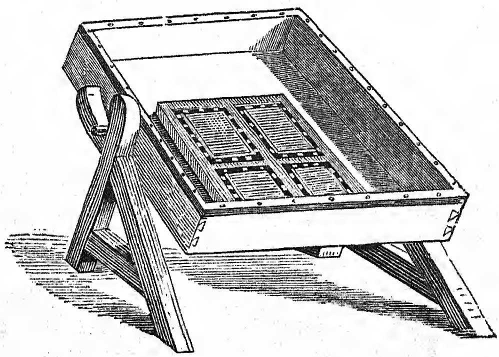


FIG. 132. LYE TROUGH.

as, and much cleaner than, oiled paper, to avoid a "set-off," when work has to be printed on both sides. Also a sheet of paper wet with glycerine and used as a tympan-sheet will prevent off-setting.

If not detected in time the set-off of ink will be transferred to the subsequent sheets in printing. Slurring, which gives the printed sheet a double or mackled appearance, is occasioned by the bagging of the sheet or sagging of the tympan or frisket, and may be remedied by slices of cork, or springs made of paper rolled up and fastened on the frisket between the pages on the part of the sheet at fault. Or it may be due to some mechanical defect in the platen, probably the platen bolts require tightening up—under any circumstances the cause must be sought for, and the fault rectified.

Cleansing type.—Solvents of various kinds, generally called *lye*, are used, but are only applicable to black ink—colours requiring turpentine. The lye mostly in use is pearlash, but other chemicals are also in demand. The proportion of water to a pound of pearlash should be about a gallon. This is the old-fashioned wash, and, after all, perhaps the best. One pound of potash to four quarts of water is another recipe. To hold the lye, troughs are used and replenished from jars in which it is stored. Illustrations are given of a portable *lye jar*, fig. 131, and a *trough*, fig. 132, in which formes may be placed and washed, being taken out for rinsing with clear water afterwards.

CHAPTER XXI

Stereotype Work—Methods of Mounting Plates for Printing—Varieties of Stereotype and Electrotype Plates—Some Hints and Suggestions on Press Work generally—Centring the Lay of a Sheet—Picks—Mode of Payment for Press Work.

THE printing of *stereotype* work is another subject requiring explanation, some firms making it a large feature of their business. The plates are mounted in various ways, sometimes on wooden, and at other times on metal blocks. There are various patented blocks of many different kinds, some taking the shape of a bed, the plates being fastened down with catches, or even stuck down by the aid of some composition. Both wood and metal blocks are largely in use, but certainly more metal than wood.

Metal is to be recommended because of its solidity, which means a sounder and firmer impression. Those of the so-called "French" kind are interchangeable, and can be made up to any shape or size by use of the different pieces. Also, when worn out, there is a considerable return for old metal. The plates on these blocks are mounted and fastened, when locked-up, by brass catches which fit into the sides and ends of the blocks, a short pin being cast on the inside, which is inserted in the block, keeping it steady, and preventing rising or blacking in printing. When made up they are imposed in the same manner precisely as type, and after the forme has been printed off, the plates are lifted from the blocks whilst on the press, and another signature laid on in their

stead, the forme being gauged and straight-edged before locking-up.

To Mount Stereo Plates.—For fixing stereo plates on type-high stereo cores, thereby saving the expense of the old wood-blocks and also the labour in fixing, the following plan is a good one: The bed is a plain iron surface of any stereo-block height. It is placed on a steam-chest to be warmed, and is then coated by a brush with cement composed as follows: beeswax, 1 lb.; gum ibus, 1 lb.; Burgundy pitch, $\frac{1}{4}$ lb. It is then removed to an iron table to cool. When quite cold, the stereo plates are placed on the dry cement and adjusted. In order to do this accurately, a light wooden frame is laid over the iron bed, with cross threads stretched at proper intervals to mark the margin. The iron bed is then again pushed on the steam-chest, and as soon as the cement is melted, the bed is shunted on to the bed of a press. Loose sheets are laid over the plates to soften the impression, and the table is run under the platen. The pressure is applied till the cement is cold, and then the forme is ready for the machine. The plates are removed with a stout knife, or melted off.

Plates are more troublesome to print, as a rule, than type, because there is more inequality in thickness, even though plates are planed nowadays—formerly they were simply turned on a lathe, and a first impression was not very satisfactory, as may be imagined. There are three kinds of plates,—electrotype, and stereotype of two descriptions, those made respectively by the plaster and paper processes. The most satisfactory for printing purposes, as regards impression, were plaster plates, for they were sharper, and had more uniformity in thickness. The plaster method of producing plates is, unfortunately, now obsolete except for type music, and, as already stated, although good, it was a slow and somewhat expensive method. Paper process plates are cheap (and nasty, too, sometimes, especially when used for poetry

works). In beating the mould, the edges, being irregular or broken, are liable to become hard, although the ends of the lines may have been packed-up first. This objection applies also to electrotype plates when used for the same class of work, owing to the manner of moulding, and the evil is increased by the subsequent backing-up of the plate to the standard pica thickness. For poetry the plaster process was really best, as the nature of its production was in favour of a better impression and a sharper appearance, as before said; but as a matter of wear and tear electrotypes are preferable, plaster plates coming next, and the paper process last in respect of durability.

If expedition is necessary for their manufacture, the paper process must, of course, be resorted to; for, as an instance of despatch, the plates used on the rotary machines for newspaper work are cast and finished in a few minutes.

In printing stereotype plates on press, the making-ready is facilitated by pulling an impression sheet, and first underlaying the low parts of the plates before patching-up for the tympan sheets. This is further facilitated if the mounting blocks are underlaid to one height in the first instance.

In printing, whether it be type, stereotype, or other plates, there are certain conditions which constitute good work, and these conditions can only be realized by painstaking workmen. The following points are evidence of good workmanship, provided the appliances, tools, and materials are good: the impression must be firm without being too hard, and making-ready must be thorough and not hurried. A weak impression is sometimes covered up by taking a larger quantity of ink, but this is wrong, because the ink is simply deposited on to the paper, and not impressed into it, thus creating a tendency to off-set. This applies to ordinary printing of bookwork on other than super-calendered paper. On the other hand, too much impression is apt to give the type a smashed appearance, and is most damaging to the fount

and disastrous to stereotype plates. In printing off, the type or plates should be perfectly clean, the roller in condition, and the distribution and rolling equal throughout. To complete this summary of good work, the following suggestions, which appeared in a previous volume compiled by the present writer, may be thoroughly digested.

Some Hints on Press Work.—Do not try to correct the faults of hurried making-ready by a weak impression, and by carrying an excess of ink to hide the weakness. Excess of ink fouls the rollers, clogs the type, and makes the printed work smear or set-off. A good print cannot be had when the impression is so weak that the paper barely touches the ink on the types and is not pressed against them. There must be force enough to transfer the ink not only on to the paper, but *into* it. A firm impression should be had, even if the paper be indented. The amount of impression needed will largely depend on the making-ready. With careful making-ready, impression may be light; roughly and hurriedly done, it must be hard. Indentation is evidence of wear of type. The spring and resulting friction of an elastic impression surface is most felt where there is least resistance—at the upper and lower ends of lines of type, where they begin to round off. It follows that the saving of time which may be effected by hurried and rough making-ready must be set against an increased wear of type. That impression is best for preventing wear of type which is confined to its surface and never overlaps its edges. But this perfect surface impression is possible only on a large forme with new type, sound, hard packing, and ample time for making-ready. If types are worn, the indentation of the paper by impression cannot be entirely prevented. Good press work does not depend entirely upon the press or machine, neither on the workman, nor on the materials. Nor will superiority in any one point compensate for deficiency in another: new type will suffer from a poor roller, and careful making-ready is

thrown away if poor ink be used. It is necessary that all the materials shall be good, that they should be adapted to each other and properly used. A good workman can do much with poor materials, but a neglect to comply with one condition often produces as bad a result as the neglect of all.

Printing on Glazed Surfaces.—It is well known that printing ink when used on glazed and enamelled paper dries rapidly and pulverizes easily, so that the work is more or less rubbed off. This is due to the fact that the paper absorbs up to a certain point those elements or substances which enter into the composition of the ink and whose function it is to bind together the solid elements. In consequence of this absorption the colour or lampblack rests like dust on the enamel and rubs off naturally with great facility. To obviate this inconvenience recourse is had to two different methods: either to modify the paper used or to add some ingredient to the ink which will cause it to adhere better. The latter is the preferable course, for it is the more simple. For printing on glazed or enamelled paper add a varnish rich in resin, such as is used for bronze work. This causes the colour of the ink to be somewhat deteriorated, but if care is taken there is not much to fear.

To Work Headings at Press.—Have the paper ruled to the desired pattern, and set up the type so that it will register in the compartments of the ruling prepared for it. Then make ready the forme and lift a sheet in, as near register as possible on to the tympan of the press—it is impossible to work headings properly at a cylinder machine. Then get some very long darning needles, the longer the better, and stick them firmly into the tympan so that they are flat to the paper. These needles, if placed as one would stick pins in for laying the sheets to, will guide the register, as they must be so placed as to hide lines of the ruling, both at the off side and bottom side of the tympan.

Centring the Lay of a Sheet.—In job work, when an impression is taken on the tympan, and the workman wishes a sheet to be printed in the centre, he has only to place the right edge of his paper at the right end of the printed line on the tympan, and mark on the sheet at the left end of the same line, and fold the remainder into one-half, marking the tympan at the left edge of the sheet to be printed.

Picks.—In working, picks, consisting of pieces of dirt choking up the face of a letter or letters, must be guarded against. The best remedy is to have the forme properly washed beforehand, and to distribute the ink thoroughly well.

Prices of Press Work.—Pressmen are, as a rule, paid by the piecework system, but there are various scales of charges in vogue in the different offices in London, and no fixed scheme can be relied on. The principle is, however, that the work is calculated by means of tokens, which are represented by 250 pulls, and the price varies according to the size of the printed sheet and the nature of the work. The token is equivalent to an "hour"; this average being arrived at because it is a fair amount for two men to work off within that space of time when once a fair start has been made. If they can produce more, the standard of excellence not being departed from, it is of course to their advantage.

ILLUSTRATED AND COLOUR WORK

CHAPTER XXII

The Printing of Illustrated Work—Care of Woodcuts—Cutting Overlays for Cut-work—The Degrees of Work in a Cut—Process, Line, and Half-tone Blocks—Rolling and Beating for sufficient Colour—Specimen of Cut printed without and with Overlay.

ALTHOUGH wood engraving as an art is almost extinct, *woodcut printing*, whether on the hand-press or on power machine, is capable of a large amount of treatment. To bring out the degrees of light and shade of an illustration which has much work in it is a task which requires a great deal of experience; in fact, the workman should possess some artistic qualification to appreciate and to give effect to the artist's design. To print a wood-block correctly, the system of overlaying must be adopted. This is performed in a similar way to ordinary making-ready, but requires much more judgement and practice. In the first place, though the woodcuts themselves are not always used, a good electrotype taken direct from the original block, provided it has not been printed from, is almost equal to the wood-block; and in the case of an accident on press to the electro, the original cut can be easily duplicated again.

If original woodcuts are used they are apt to become warped, and the joints, though bolted, are liable to open through a variety of causes, such as washing over or rapid changes in the weather. In any circumstances, when

illustrations are printed from woodcuts, they should be cleaned with turpentine and wiped carefully with a rag—water must not be used; if left on the hand-press for any length of time, they should be run underneath the platen with the tympan first turned down. Sometimes it is well to pull the bar over and fasten it with a slight impression on. In the event of the cuts warping or twisting, a good plan is to lay them face downwards on something damp and run them in under the press, leaving them overnight with a small amount of impression on.

In preparing an *overlay*, the engraver's proof should be obtained when possible, or, in the case of process blocks, the original drawing or photograph, as these very greatly assist the workman in bringing out details, and at the same time giving prominence to the parts required. It is quite possible to give two different effects to any cut by the system of overlaying, if the meaning of the picture cannot be readily grasped; therefore it is very advisable to work by some proof or copy in cutting out. The same amount of delicacy cannot always be realized in printing as in an engraver's proof. Perhaps the latter is taken singly, with a very special ink, and burnished up by hand to give the necessary difference in light and shade—even the excess of ink, in light tints, sometimes being partly wiped off. However, the india proof should be copied as far as practicable in the making-ready.

The work in a cut, assuming it is landscape, may consist of three degrees as regards depth, *i.e.*, solids, light tints, and medium—the foreground usually being the more solid, and the background the lighter work, the intermediate part forming the medium shade. This is a general rule, but objects in the background have sometimes to be brought forward by means of overlaying, and the reverse applies to the foreground, in which case it is requisite to cut away. Distance must always be allowed for in looking at a picture; this can

be increased or decreased in a very great measure by perseverance in the art of overlaying. It is an important thing, too, that rottenness of impression should not be mistaken for light tints, as frequently in cutting away the workman is liable to take too much. All the work must be there, and, as before said, there is a distinction to be drawn between lightness and rottenness or broken lines. If the artist or engraver desired the latter, he would not go to the trouble of cutting work which was not to appear. Let your work be sharp and sound, even if very light. This is a great feature in woodcut printing. In cutting away lights skiver or peel away the thickness of paper, and do not make a straight deep cut or the effect will be too sudden. Vignetted work is particularly difficult in this respect, and these remarks chiefly apply to this kind of work.

Cutting overlays.—To commence with the overlay: pull three or four good sound flat impressions, with not too much ink, on a hard kind of paper—cream wove is preferable, say about 24 lb. large post; do not use a laid paper by any chance. When this has been done, they should be put aside to dry. Four is an advisable number to pull in case of accident, but three only will be really required for most cuts. The object now is to blend the three impressions into one overlay, by cutting away certain parts of each and pasting together. Let the paste be good and strong, but of a thin consistency, otherwise the delicacy of your work will be impaired. Take one of the pulls, and treat this as number one, or foundation for the whole. In this one all the light tints may be carefully cut out—not abruptly, but in a gradatory manner—by using the knife in a slanting direction, and consulting the engraver's proof for differences of light and shade. When this has been done thoroughly, the second pull can be adapted for the solids, by cutting these parts out very clearly and sharply; the edges of these need not be cut out so slopingly, but great care must be

taken in pasting these pieces on, that they fit exactly on to the corresponding portion of the first impression cut out, because, if by any means they shift, the whole labour expended on the overlay is wasted. If the paste is not sufficiently tenacious, the pieces are likely to move in printing, and the result may be disastrous to the appearance of the cut. Number three of the pulls may be treated thus: cut away the light parts, and retain the solids and medium. In cutting out the last part of this pull the medium parts should be softened down in the cut by slanting the knife. To obviate hardness on the edges of the illustration, the overlay, when all has been pasted together, may be rubbed down slightly, or even skivered. These three thicknesses will be sufficient for most blocks; difficult cuts may have four, if there is a broad difference between the depths of shade comprised in the illustration. Before putting the overlays on, if the cuts are printed with type, the blocks should be underlaid so as to bring them up to a very slightly higher level than the type. In fastening the overlays up, after the remainder of the making-ready has been performed, great care must be taken that they are pasted down in their exact position. When they have been fixed, and a trial sheet has been pulled, they can be further humoured and touched up. Overlays should be preserved, packed up, and labelled, because, in the case of reprints, much valuable time and expense are saved by using them again.

Process blocks in line as distinct from half-tone blocks are generally of a more sketchy nature, and very good specimens of photo blocks with respect to fineness and details of work have been produced. Special papers, as regards finish, are even more necessary for these than for woodcuts, owing to the little depth in the face of the blocks, and dry super-calendered papers are the most suitable for their proper production. Very frequently more effect is got out of a flat pull, supposing it has been first carefully levelled,

than by an elaborate overlay. The chief points are to give sharpness to the fine lines, and firmness to the solids. A sharp and hard impression, with a suitable paper and good ink, is required. In printing these the original drawing, from which the block is made, is a good guide in making-ready. As dry paper is used for these process cuts, a good drying ink, to work clean, is necessary. For woodcuts the same kind of paper is used, but plate paper, or woodcut (semi-plate) paper, is perhaps more frequently in demand for this class of work.

Half-tone blocks are more in evidence than ever, and here again little or no overlay is required provided the underlaying is first attacked in a workmanlike manner. All these blocks should be made perfectly type high all over because, if done unequally, the block would rock. Some printers prefer that the cut should be a trifle higher than the type, but if too high the type would then suffer. If overlaying is requisite, use the best and thinnest possible tissue, for the tones already exist in such pictures and require but little emphasizing if properly treated as suggested in the early stages of making-ready. It is absolutely necessary that a suitable ink and the proper kind of paper be employed, otherwise the labour is in vain. Unfortunately the so-called "art" papers are somewhat objectionable both in handling and to the eyesight, but there is no getting away from the fact that such paper does give the best effect if brilliancy and definition are required. Unsuitable paper and ink yield poor results, such as flatness and want of life in the illustration.

Printing heavy cuts.—In hand-press work it is necessary to beat the cuts with the roller in order to impart the necessary amount of ink. It requires some skill to perform this properly if the blocks are placed in the midst of type. On machine, exceptionally heavy cuts are sometimes made a separate working.

Examples of woodcut printing.—For the sake of comparison we give overleaf two illustrations. Fig. 133 is simply a flat pull without any making-ready whatever, and fig. 134 is printed with an overlay of three pieces cut out and pasted together. These prints are taken from two separate electrotypes of the same wood-block. If these different impressions are carefully studied, the result of overlaying will be seen. The exact details of each overlay cannot be shown in print—at least, not in any cut with a fair amount of work. The difference, however, between two prints, one overlaid and the other not, is sufficiently marked to give some idea of effect.

A competent person who has an appreciation of pictorial effect can always obtain much better results from a woodcut or process block than one who is not gifted with some amount of taste, though the latter may labour at it, and spend considerably more time over it.

Let it then be remembered that the second specimen shown overleaf has been executed simply with three thicknesses in overlaying, a little subsequent finishing being applied when placed in position. Some cuts of more elaborate nature as regards light and shade may take four or even five thicknesses, but three are sufficient for an average cut. Moreover, it is best to avoid so many distinct and separate pieces, as the impression of any great thickness on the surface of the cut has a damaging, or at least depreciating, effect on the block itself after any large number has been struck off.

Rolling the paper, before as well as after printing, improves the appearance of illustrations, but the paper need not be glazed in the first instance if it has already a good mill-finish, because rolling, unless carefully done, is apt to set up an unnatural surface to the paper, which detracts from its value.

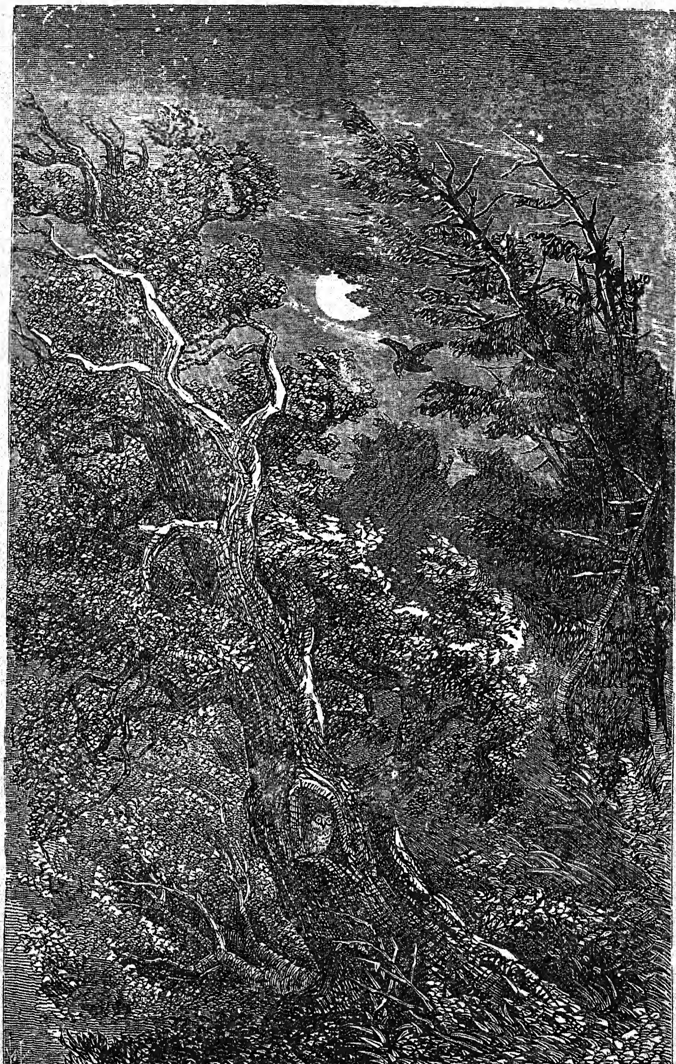


FIG. 133. WOODCUT PRINTED WITHOUT OVERLAY.

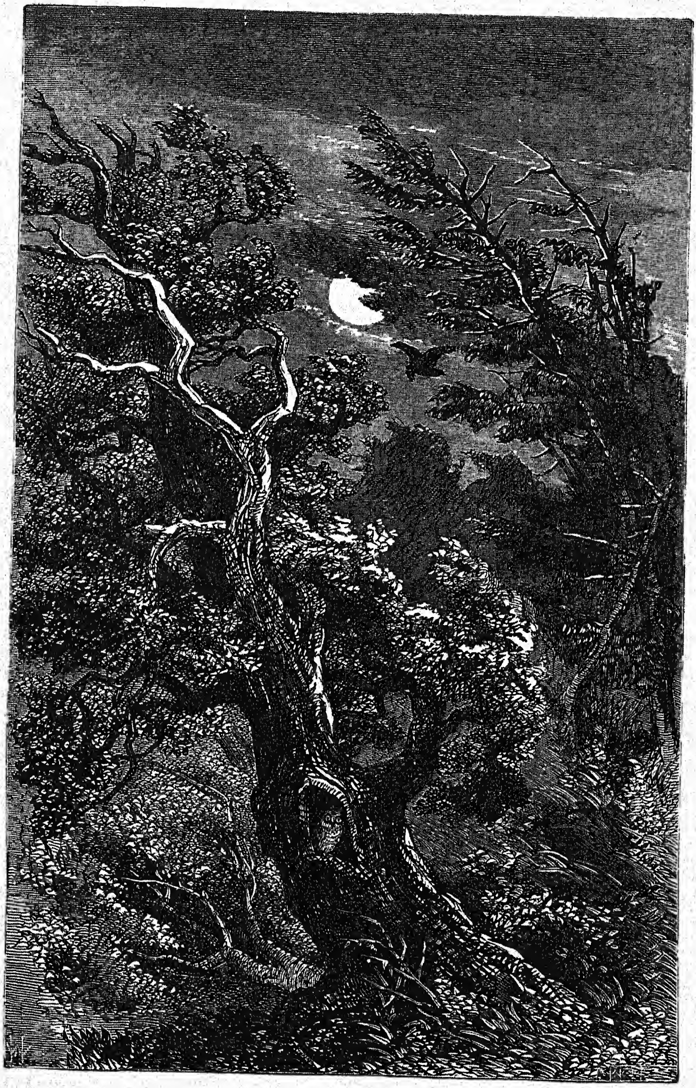


FIG. 134. WOODCUT PRINTED WITH OVERLAY.

CHAPTER XXIII

Colour Work—Three-Colour Printing—Method of Printing by Underlaying and Skeleton Formes—Hints on Colour—Selection of Colours to Harmonize—Register of Colour Work—Bronze Work and appliances for same—Some Remarks on Bronze Printing.

COLOUR work, in either printing department, is an important branch. *Colour printing*, in a general way, as far as letterpress is concerned, is confined to works printed in any one colour, usually expressed as being in monochrome, or books which are rubricated, or have a red line or border round the pages.

Three-colour or trichromatic printing, obtained by the use of the three primary colours, is quite another method, and as this process is now much used for the illustration of books and other work, we give in the next chapter some account of the methods employed in that class of printing.

There are two methods in practice for ordinary colour work, *i.e.*, either by underlaying or by printing from a second or "skeleton" forme—the latter being adopted where there is much of a second colour to print, the former when there are only a few lines here and there. This has been explained before in the part devoted to colour work in the composing department. For the rubricating of religious works a red of a vermilion hue is desirable, and a pinky red is to be avoided. Other colours, of course, are dependent on taste; but whatever be selected, let the colours be good, not dirty, and always work them on a slab of marble or

porcelain, as iron has a tendency to destroy the beauty of the colour. Red ink must not be applied to electrotypes unless brass- or nickel-faced, because copper has a chemical effect on that particular colour, turning it almost black, or dirty, after a few impressions. The following is a good, but somewhat slow, method of obviating this particular difficulty:

Red Ink printing from Electrotypes.—Take one ounce of prepared gold size and a quarter of an ounce of the "lake-brilliant" of Cornelissen, and grind them well together with a muller. Then roll the electro with this preparation and let it stand for twelve hours, when it will be found as hard as stone, and the vermilion may be printed from the plate without the least injury to the block or the brilliancy of the colour.

If other than red and black are used, see that the colours harmonize well, whether two or more kinds, for even two colours may be antagonistic to each other. The laws of harmony are fixed and must be studied. The following rules may be consulted:

Hints on Colour.—Yellow and carmine or deep red produce scarlet or vermilion; carmine and blue produce deep lilac, violet, and purple; carmine, yellow, and black produce a rich brown; yellow and black, a bronze green; yellow, blue, and black, deep green; carmine and white, pink of any shade; ultramarine, white, and carmine, deep tones of lilac; violet and white, pale lilac or lavender; cobalt and white, lively pale blue; and Chinese blue, deep bronze blue, chrome, pale lemon, any tone of emerald green. Amber is made from pale yellow, chrome, and carmine. Red brown is made from burnt umber and scarlet lake. Light brown is made from burnt sienna shading with lake. Blue and black are made from deep blue or deep black. Salmon is made from burnt sienna and orange, shading with white. On the next page are given certain combinations of colours.

TWO COLOURS WHICH HARMONIZE WELL.

Scarlet red and deep green.
Light blue and deep red.
Orange and violet.
Yellow and blue.
Black and light green.
Dark and light blue.
Carmine and emerald.
Red and black.
Black and warm brown.
Violet and light rose.
Chocolate and bright blue.
Maroon and warm green.
Chocolate and pea-green.
Claret and buff.
Violet and pale green.
Deep blue and golden brown.
Deep red and gray.
Deep blue and pink.
Maroon and deep blue.
Black and warm green.

THREE COLOURS.

Orange, black, and light blue.
Light salmon, dark green, and scarlet.
Brown, light orange, and purple.
Dark brown, orange yellow, and blue.
Crimson lake, greenish yellow, and black.
Red, yellow, and blue.

FOUR COLOURS.

Black, green, dark red, and sienna.
Scarlet, dark green, lavender, and black.
Ultramarine or cobalt blue, vermilion, bronze green, and lilac.
Sienna, blue, red, and black.

We add here some further remarks on the choice of colours:

The Selection of Colours.—The following table will be found useful in choosing the various tints, as, by examining them in the order here given, the eye will at once detect the slightest differences of shade. To refresh the eye

Look at	Greens	*before choosing*	Reds.
,,	Blues	,,	Oranges.
,,	Violets	,,	Yellows.
,,	Reds	,,	Greens.
,,	Oranges	,,	Blues.
,,	Yellows	,,	Violets.
,,	Tints	,,	Browns.
,,	Browns	,,	Tints.

Register is an important item in colour work. Extra points can be used, in the shape of the paste-points already

mentioned, made of drawing-pins, pushed through the tympan from inside, and pasted over on the back with paper in order to prevent them from shifting. The holes made by these points are very fine and are not so conspicuous as the ordinary points, the pins of which are generally larger. Four points used of this character will insure greater accuracy.

Bronze work comes under the general head of colour work. The bronzes can be obtained of gold and silver. The part to be printed is rolled and pulled with an almost colourless varnish preparation, the bronze then being applied with

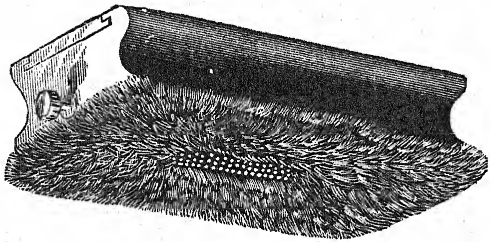


FIG. 135. BRONZE BRUSH.

wadding, and the superfluous metal brushed off with the same piece. They should receive a further cleansing afterwards with a fresh piece of the material. The bronze portion of a forme should be printed first, as the bronze is likely to adhere to any part of a sheet printed in another colour if it has not had time to dry. This is the old way of performing the operation, and is satisfactory for small and occasional work.

Bronze brushes, fig. 135, have been made recently, with a receptacle to hold the powder, which is liberated as the brush passes over the required part. The proper amount can be regulated by the use of the screw at the end of the brush. This powder is injurious when inhaled to any

extent, and a kind of respirator is necessary if much work has to be done, as the bronze has a tendency to float about.

Mechanical appliances have also been lately introduced, adapted for bronze work in large quantities. An illustration is here given, fig. 136. The sheets are fed in at one end as in a rolling machine, and are turned out at the other end bronzed.

Rolling is a decided improvement in bringing the bronze

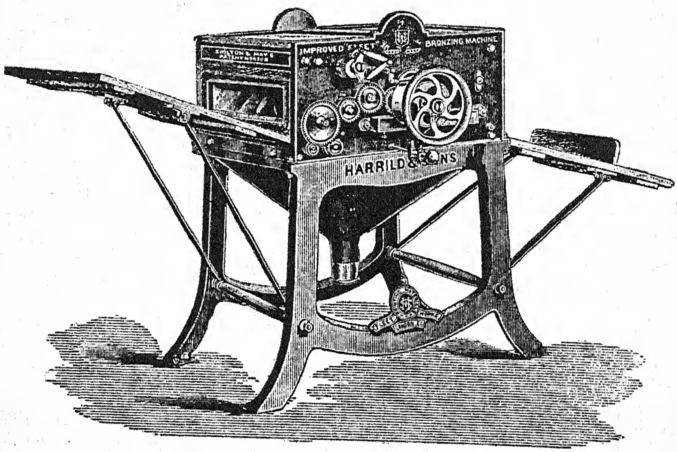


FIG. 136. BRONZING MACHINE.

up, as it gets rid of the somewhat granulated appearance which bronze always gives as distinct from leaf printing. The latter method is not usually adopted in letterpress printing.

Another method is the following:

How to improve Bronze printing.—Bronze work is very seldom thoroughly satisfactory. Its failure, as a rule, rests in the inability to fix it firmly on the paper. Of course rolling is the most reliable remedy, but if you do not

happen to have a rolling machine, or the inclination to invest in one, adopt the following method: Work the forme with gold size and apply the bronze in the usual way; when the number required is completed, simply take all the rollers off the machine, clean the forme, but do not disturb it, and run the sheets through the machine again off the clean forme. The appearance of the work is greatly improved by this process, but it is needful that the lay on each occasion should be accurately made.

It may be mentioned here that there are various regulations issued under recent provisions of the Factory Act which apply to those offices where much bronze printing is carried on, and a perusal of those provisions is recommended.

CHAPTER XXIV

Three-Colour or Trichromatic Printing—The Dissecting Filters—The Need of really good Blocks—Suitable Inks—Working-off—Paper necessary for Printing-off—Suggestions.

AS already explained, the art of *three-colour* printing,—termed *trichromatic* printing in a general way, is a method very much in fashion just now. That it has been much improved on during recent years cannot be denied, and commercially it is a success, but artistically, perhaps, not so, although there are enthusiasts who claim for it perfection. Without doubt it has obtained almost high-water mark in the reproduction of certain subjects, but we hesitate ourselves in claiming for it absolute perfection, for no mechanical means of reproduction can hope to rival in all its beauties the full effect of a painted picture, whether in oils or in water-colour, although we do admit that some very good effects are obtained by this method of reproduction.

With great care proofs may give almost faithful results, but absolute fidelity in comparison with the original cannot be guaranteed in bulk, when the subject is on machine, and in course of running off a large number of copies. More or less of any one of three pigments is apt to upset the proper balance of colours, and thus alter the effect as a whole.

The researches of Ives and others in the field of photographic optics have demonstrated that it is possible to construct photographic positives which will discriminate between natural colours. The photographer does this by making negatives in register on specially prepared sensitive

plates, so arranged that each one shall automatically select only a sympathetic colour, and reject any other. In this way a negative may be obtained from any object which shall reproduce only so much of it as is yellow, another shall reproduce the red, and another the blue. If half-tone blocks are made from these and are printed in pigments corresponding as closely as possible with the colours selected by the respective negative filters, a fairly satisfactory result may be obtained. It is clear, however, that any such result is an approximation only, and its success depends largely upon the character of the subject to be reproduced.

In practice, coloured films or fluid tanks are used as light filters. They are used in conjunction with the lens, and the function they discharge is to absorb rays of similar coloured light and to permit the passage through the lens on to the sensitive negative plate only of complementary light rays. So three negatives are made, one of which gives all the red transmitted from the original, another all the yellow, and the third all the blue, and these can be either continuous tone negatives from which positive transparencies are made to be used in the subsequent production of the screen negatives, or the screen negatives may be made directly from the original.

Just as with half-tone blocks intended for printing in one colour the gradations of light and shade are expressed by means of dots, the size of which is primarily determined by the quantity of light transmitted to the sensitive negative plate, and to a lesser extent by their subsequent reduction in area during the process of fine etching, so in the case of half-tone blocks intended for colour printing it will be noticed that in the first instance far more of each colour is found than is necessary to obtain the desired result. There must be no superimposition of colour, otherwise a degraded and muddy print results, but the process worker will have arranged his screens at such angular distances for the

respective colours that no decrease in the luminosity of colour arises from the intercrossing of the rows of dots.

For work of commercial character it is admirably adapted, but, as indicated, one must not expect absolute fidelity in the reproduction of works of art. Full credit must, however, be given to all concerned in this class of work for the results obtained so far. In the first place, it is essential that really good blocks be produced, and this initial difficulty is one very largely dependent on the photographer and his appliances, in dissecting the various colours. The next important thing is the ink employed, and it seems to be an open question as to what precise three shades of yellow, red, and blue constitute the real three primary colours.

Every process firm has its own colour scheme of analysis to which certain pigments correspond, and the printer should be careful to ascertain exactly what ink and what particular make of ink has been used in pulling the colour proofs, and if he has to work more than one subject on the same sheet he ought to satisfy himself that the same colour scheme has been applied to their production, otherwise endless trouble is in store for him.

That these inks should be good, full bodied, permanent, and absolutely transparent, goes without saying; for if they were in any way opaque the results would be disastrous. The printer should not attempt to make these colours for himself, but purchase them of any firm making a speciality of these inks. Let him use the best kind, for any other quality only means trouble, vexation, and disappointment in the end. The introduction of aniline colours into inks is but a snare and delusion. They certainly impart brilliancy for the time being, but they will not retain permanently their brightness, for these colours are of the fugitive order.

The making-ready of these blocks for printing requires much the same treatment as that accorded to the ordinary half-tone illustration, good register being an all-important

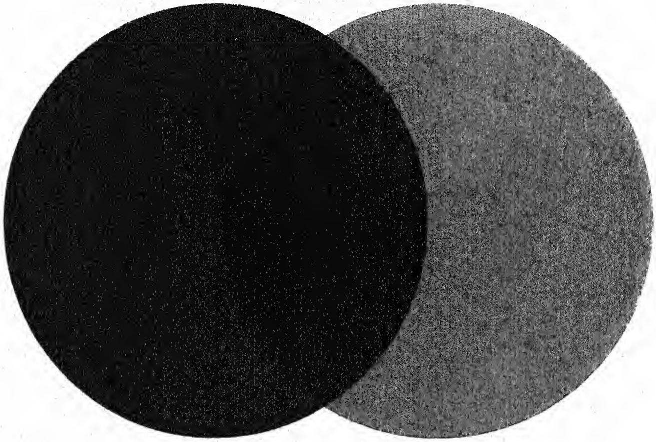


FIG. 137. TRICHROMATIC COLOUR CHART.

factor in the satisfactory printing of three-colour work. Again, it is important that one colour should be fairly set and dry before another is superimposed on it. If, however, the first or second printing is allowed to stand too long, a difficulty of another kind is created, and the precise psychological moment is best realized by actual experience of a practical nature, rather than by any rule of thumb.

Paper forms another important element in the successful working of this process. The blocks being screen-made and of an extremely fine and graduated grain, the so-called art papers are necessary if brilliancy of effect is desired. This, of course, is a point to be striven for; otherwise, the results will be disappointing by the completed picture turning out flat and lifeless.

The best shades of inks for the purpose are (*a*) primrose yellow, (*b*) crimson red, (*c*) cyan blue for the three primary colours. By the use of these inks, and given properly dissected blocks with the necessary tones, the secondary and tertiary colours will be obtained by careful working. As will be seen from the accompanying simple colour chart, fig. 137, the superimposition or overlapping of the three primaries, yellow, red, and blue, gives orange, green, and violet as secondaries. Citron, russet, and olive are the tertiary colours, the other divisions following in the natural order; all of which may be saddened or diluted by the addition of gray and white in their composition. The usual order of working is, (*a*) yellow, (*b*) red, and (*c*) blue.

For further information on this subject, which is an absorbing one, the student is referred to special text books giving fuller details. It must, however, be borne in mind that to insure the best results in printing, the blocks must be carefully made in the first instance; secondly, the ink must be good and pure; and the paper must be suitable.

Given all these conditions, and the necessary experience, the printer should be able to turn out fairly good work.

MOTIVE POWER

CHAPTER XXV

Motive Power: Steam, Gas, Oil, Water, and Electricity—Beam, Horizontal, and Vertical Steam Engines—Shafting, Riggers, Speed Pulleys, Brackets, etc., for Driving Purposes—Horizontal and Vertical Gas and Oil Engines—Suction Gas Plant—Electric Motors.

BEFORE commencing the important section devoted to machine printing, *motive power* must first be considered. This power is derived from several different sources, viz., steam, gas, oil, water, and electricity. The first is the best for driving a large number of machines; for a few, gas is admirably adapted, even if two or three engines are laid down. Water power is used in two ways, according to circumstances; in the country a passing stream can be utilized, and machinery driven by the water-wheel—a system applied to other factories at the water's edge. Another form of water-power is the Backus motor, but this is only available for very small requirements, as the pressure of water in town supplied by the different companies is not equal to any great demand.

Since this work was first written, in 1890, electricity has, as was foretold in that edition, come very largely into use not only for lighting purposes, but also for power. One great advantage is that it is adapted both for small and large offices, because every machine may be driven independently, each one having its own motor. By this means a certain

amount of steadiness in driving is insured, and the unsightly, and frequently dangerous, shafting and belting necessary for steam or gas power are dispensed with.

Where *steam engines* are still employed the choice depends largely on the number of machines to be driven; the nature of these also must be considered, as some machines require more driving power than others of an

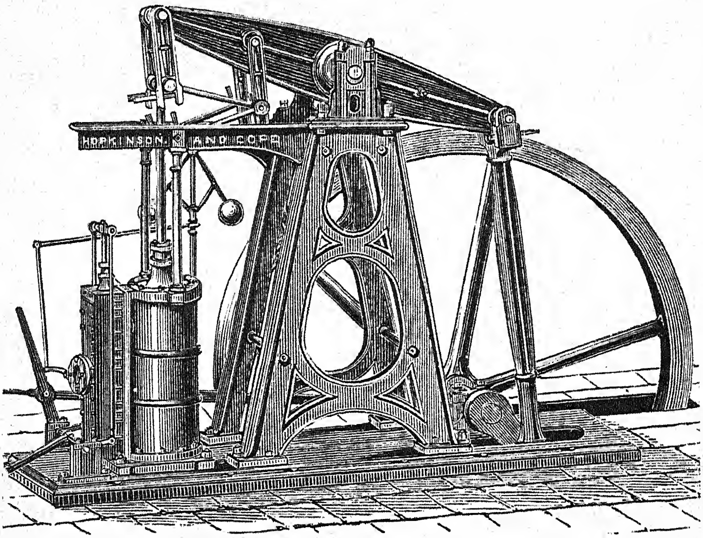


FIG. 138. BEAM STEAM ENGINE.

equal size. Before placing an engine, a perfectly sound foundation must be secured for it; therefore it is best to have it in the basement, to obviate any vibration in driving. The boiler (Cornish ones are more usually adopted) should be situated as near as possible to it, because steam does not lose so much force in passing from the boiler to the engine if there is only a short distance to travel. The different steam engines may be classified as follows: (*a*) beam,

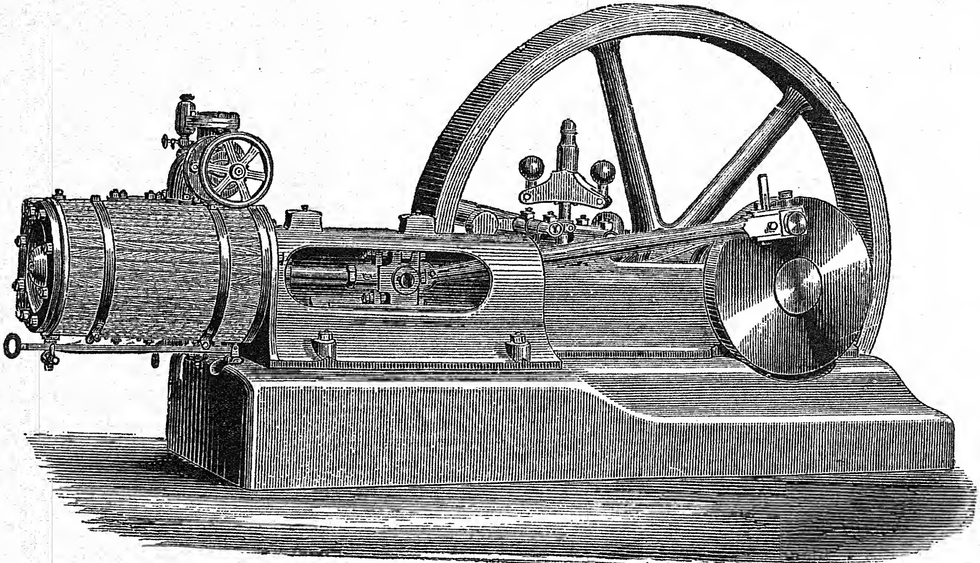


FIG. 139. HORIZONTAL STEAM ENGINE.

(*b*) horizontal, (*c*) vertical, (*d*) table, (*e*) combined vertical engine and boiler.

The *beam engine*, fig. 138, is preferable if a large number

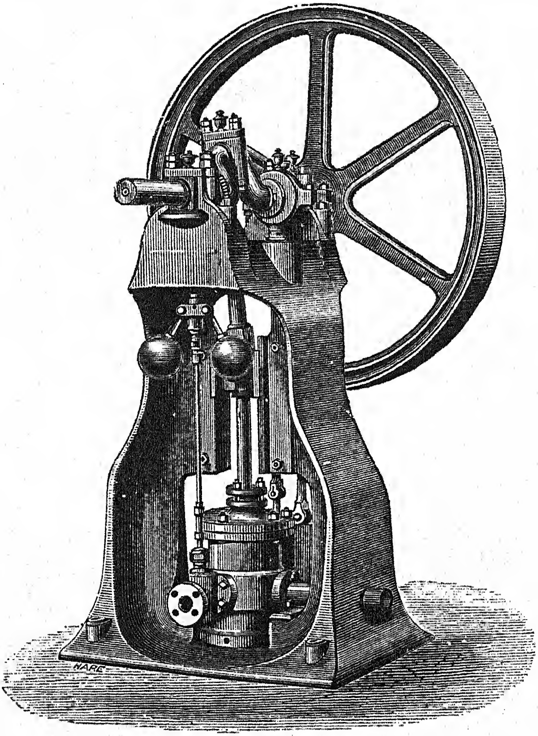


FIG. 14). VERTICAL STEAM ENGINE.

of machines have to be driven, and particularly if they are of different kinds. This difference in character of machine —cylindrical or platen impression—must be allowed for by counter-shafting, otherwise an equal power will not be maintained if driven from the main shaft. If there are many

machines of platen make, drive them from a counter-shaft, that is, a small shaft connected by a band from the main. These engines consume rather more fuel, and are more expensive than the other kinds, but are recommended for steadiness in driving and for greater power.

The *horizontal engine*, fig. 139, comes next; this is, perhaps, in more general use, as it occupies less room than that of the beam kind, and is sufficient for ordinary requirements. In very large offices, where a beam engine is used, a horizontal engine is advisable as a reserve in case of a breakdown. It is also as well to have an additional boiler for the same purpose.

Another reason for placing these in the basement is because they can be farther apart from the machine-room, even if the basement is used for machinery, because the atmosphere of a boiler-room is not conducive to the comfort of the employés, the care of rollers, or other conditions affecting good work; but, on the other hand, it must once more be borne in mind that the engine too far removed is a disadvantage, because, with long belts in driving, power is lost to some extent.

Two other varieties, the *vertical*, fig. 140, and the *combined engine and boiler*, fig. 141, are handy for smaller power, and where only limited space is at command. The same remarks apply to the *table engine* for still smaller power and space.

When fixing on the position of the engine, choose a dry situation; it is also important that the boiler should be examined occasionally, the flues and tubes being kept quite clear and clean. Governors and steam-gauges should be tested periodically to insure perfect safety. The incrustation which forms inside the boiler must be removed from time to time. There are many adjuncts for the purpose of economizing fuel; two important ones are, first, the covering of the boiler and steam-pipes with a coating of special composition which keeps the heat in and reduces the temperature

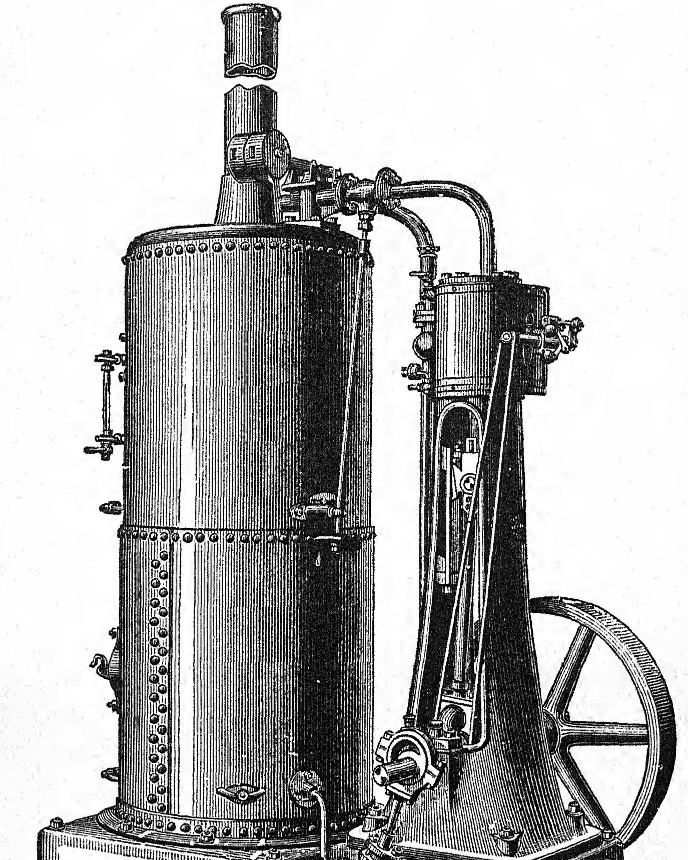


FIG. 141. COMBINED STEAM ENGINE AND BOILER.

of the boiler-house and engine-room very considerably, and the other an apparatus for the automatic pumping into the boiler of hot water instead of cold; this in itself is a great saving, as the existing quantity of steam in the boiler is not depreciated when a fresh supply is taken in.

Shafting, riggers, etc.—Before leaving the subject of steam we append a few illustrations, fig. 142, on the next page, of the different parts used in connection with the driving power.

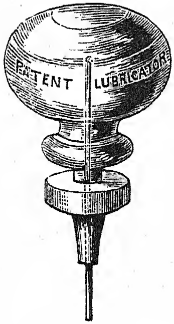


FIG. 143.
LUBRICATOR.

Lubricators.—A good one is the *needle lubricator*, fig. 143; it can easily be attached, and requires little attention.

With these appliances and the aid of belting the necessary power can be imparted to the machinery. In driving by steam, good stoking is another important matter as regards the amount of fuel consumed. The care of a boiler is also a consideration, in minimizing the risk of explosion; therefore it is requisite to appoint a reliable and practical man to look after these engines and boilers. Another point is the coal used; smokeless Welsh is the best undoubtedly, as it burns better and the flues and tubes do not require so much attention.

Gas motors of various kinds—both horizontal and vertical, and up to any power, estimated by "man," "brake," or "horse"—are in the market. In laying down engines, either gas or steam, power should be in excess of what is actually required, so as to be amply provided. For small offices one horse-power beyond the normal quantity is advised, whilst for larger offices two, three, or even four horse-power in excess of actual requirement should be ordered. In the case of steam, the capabilities of the boiler as regards the pressure of steam must be regulated according to the horse-power of the engine.

Of gas engines, the "Otto" is a serviceable one for driving the larger quantities of limited machinery—the horizontal,

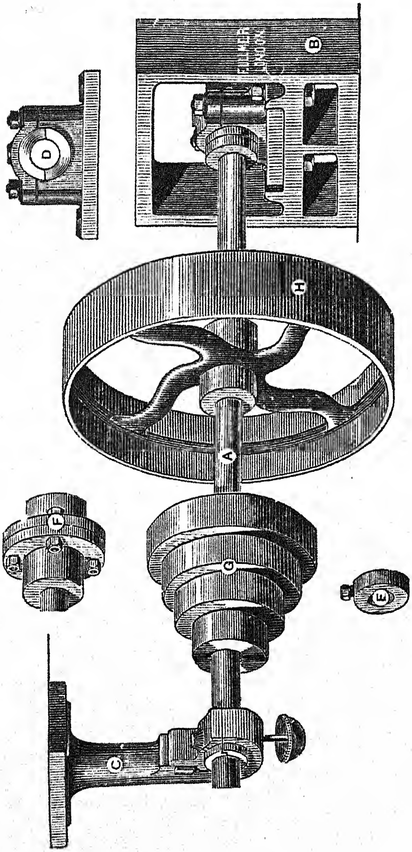


FIG. 142. SHAFTING, RIGGING, ETC.

(A) The shaft.
(B) Wall-box.
(C) Bracket, or hanger.
(D) Bearing.
(E) Collar.
(F) Connection.
(G) Speed pulleys.
(H) Rigger.

fig. 144, for greater, and the vertical kind for smaller power, although the latter kind is rarely made nowadays.

These machines require very little attention, and are handy in being practically ready for immediate use. They can be started and stopped momentarily, and they can be placed in the machine-room without detriment. A good plan is to have them boxed in with glass sides, which keep them free from dirt and dust. The principle of these engines is: an admixture of gas and air in the cylinder is exploded by means of a small gas jet, this giving the necessary impetus

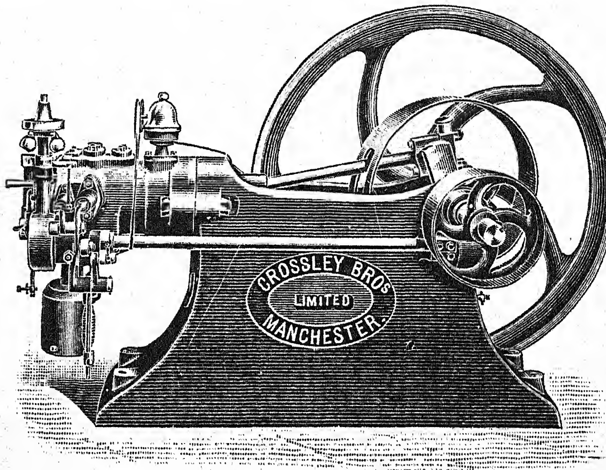


FIG. 144. HORIZONTAL GAS ENGINE.

to the fly-wheel. These engines should be kept scrupulously clean: therefore the covering in is suggested. The Otto is reckoned one of the safest and most reliable engines propelled by gas which have been offered to the trade. The most recent machines of this make are much improved in various details which add to the efficiency of the engine and also reduce the consumption of gas.

Gas engines have recently been much improved in design, and take up far less space than formerly. They can be made

to run almost noiselessly, and, provided they are well looked after and not seriously overloaded, will prove to be one of the most economical and convenient forms of driving.

Electric ignition is now very generally fitted, and it is possible to start an engine in about a minute. This kind of engine needs practically no attention, and can be left for hours together even when the producer gas plant is used.

In addition to the above, the power has been very materially increased; for instance, an engine of the size

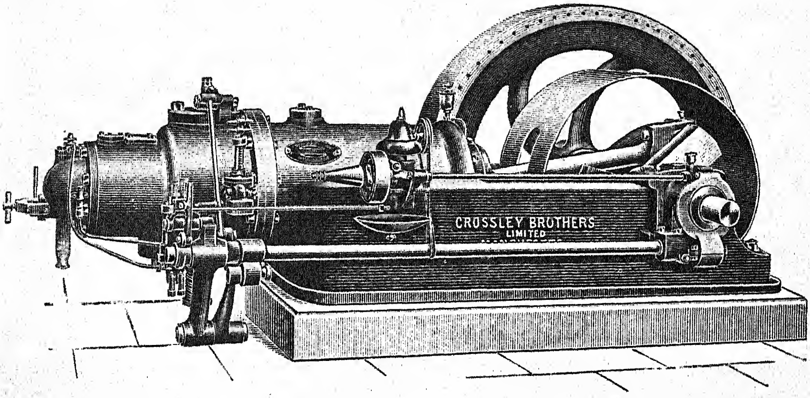


FIG. 145. OIL ENGINE.

originally called $\frac{1}{2}$ h.p. nominal, but now called K type, in 1880 gave 1 h.p. actual or brake; in 1890 it gave $1\frac{1}{2}$ h.p., in 1895 $2\frac{1}{4}$ h.p., in 1900 $3\frac{1}{4}$, and at the present time 4 brake h.p., and this addition to the power has been obtained without any increase in the first cost of the engine.

In some parts of the world crude oil is a cheaper fuel than either coal or gas; in such cases the *Oil Engine*, fig. 145, is the type adopted. These engines are worked on the "Otto" principle.

The following table gives the cost of running a 10 B.H.P. engine with various fuels:

FUEL.	PRICE.	COST PER B.H.P.
Town Gas	2*s*. per 1,000 feet . .	5*d*.
Refined Oil	7*d*. per gallon . . .	7*d*.
Crude Oil	3*d*. per gallon . . .	3*d*.
Anthracite Coal . .	25*s*. per ton	12*d*.

In larger installations, say 12 brake h.p., it would pay to put down a gas engine to work with its own producer gas plant. This would effect a still further economy, especially in those cases where coke is easily procurable. This can frequently be obtained at 15*s*. per ton, which is equivalent to 12 brake h.p. for a penny.

With regard to *Suction Gas Plants* where coal is the basis of power, producer gas used in gas engines is the best and the most economical. Many different types of plants are made, to use anthracite, coal, coke, lignite or indeed almost any fuel. It is only attempted here, however, to describe Crossley's suction plant, which is extensively used for working with engines of all powers, from 5 to 500 break h.p. or more. It consists mainly of:

1. The generator or producer.
2. The coke scrubber for cleaning the gas.
3. The sawdust scrubber (generally arranged above the coke scrubber), and
4. An expansion box in most cases to take the place of the gas bag ordinarily used with the pressure system.

As shown (fig. 146), the producer consists of a cylindrical firebrick-lined chamber, separated from the outside metal by a coating of sand. The firebrick lining rests on a metal ring supported on two cast-iron segmental-shaped boxes termed "superheaters," placed at the hottest part of the fire and mounted on a flat plate carried right across the producer. This plate has a hole in the centre in which rest the bars of the firegrate. In this way a pit is formed im-

mediately below the firegrate, and in this pit the steam and air used in the gas making process mix before passing together through the fire. On the top of the producer will be noticed a feeding hopper, through which the fuel is introduced. Around the cylindrical "bell," defining the depth of fuel in the producer, is formed the "well" of the saturator or boiler. Cold water is introduced into the bottom of this well and fills the rest of the saturator to a level defined by an overflow pipe. The saturator is shaped like a flat dish extending to the outside shell of the producer. This dish has a series of baffle plates on its under surface which form passages through which the hot gas has to pass, giving up its heat to the water before going to the coke-scrubbers to be cleaned. Two vertical steam-pipes form the connection between the saturator and superheaters.

Producer gas is obtained by passing air and steam through incandescent fuel. Two simple reactions take place expressed by:

$$_2C + O_2 = {}_2CO$$
$$C + H_2O = CO + H_2$$

That is to say, the oxygen of the air combines with the carbon of the fuel to form carbon monoxide, and the steam together with more carbon forms more of the monoxide and free hydrogen. In addition to this a certain amount of marsh gas, CH_4 and carbon dioxide, CO_2, are formed, so that the ultimate composition of the gas is—combustibles CO, A_2, and CH_4, diluted with the non-combustibles CO_2 and N_2.

In the suction plant, here described, the requisite steam is raised in the saturator mentioned above by extracting the heat of the gas as it passes from the fire. All such plants to be economical must work on the "regenerative" principle. The older form of producer, in which even for small sizes a steam boiler was required, cooled the gas before sending it to the engine, by passing it through the

atmospheric coolers, or, in other words, coal was first burned under a boiler to add heat that was finally wasted.

Fig. 146 shows a combination of gas engine and suction gas plant and serves to illustrate the extreme simplicity of a standard arrangement and the small space occupied by a complete installation.

A further great advantage in this producer is the formation of the grate with the pit below it. By this means any

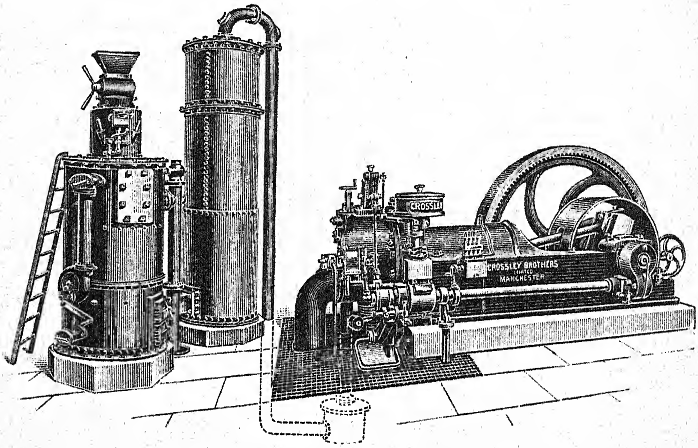


FIG. 146. ENGINE AND SUCTION GAS PLANT.

clinker forms in a flat cake over the grate and can readily be removed through the fire-doors. In addition to this, means are provided by which clinkers can be removed from the bottom of the firebrick lining, should it form there, and the clinker immediately above the grate be broken up while the plant is at work. This ensures successful working, even with anthracite coal not of the best quality.

The gas producer plant requires very little attention. It will have to be fed about every three hours. The man who fills the scrubber with coal will have to poke the fire occa-

sionally. In some parts, where coal is not available, charcoal, coke, cotton seed, coco-nut husks, mealie cobs, wood refuse, or any such fuel may be used.

Electricity, as already said, is much in favour, for its advantages are many. One advantage is that a number of small machines may be driven in a group from one motor by the aid of a counter-shaft, whilst the larger machines, often of a varying size and differing requirement of power, may be driven by separate motors, fig. 147, which dispenses with a deal of unnecessary and frequently dangerous shafting and belting. This independent method also ensures a greater steadiness in driving, which is not possible where the power is derived from one source only, such as a single steam or gas engine for the whole department, and the machines are of various kinds and sizes. Besides, it must not be forgotten that a certain amount of power is lost by the fact of having to drive a shaft, sometimes a heavy one, even if electricity is employed, and one motor has to do duty in driving several large machines.

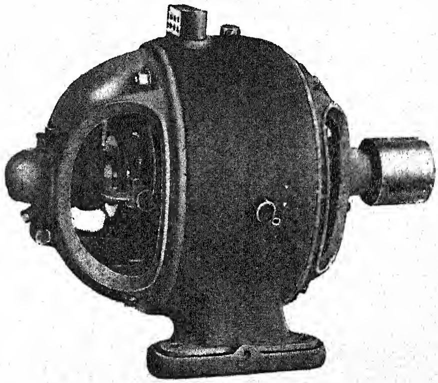


FIG. 147. ELECTRIC MOTOR.

The first cost of a good motor will compare favourably with that of gas engines or other forms of motive power. As they have very few wearing parts, with ordinary care in handling the cost of repairs is not a large item.

They occupy little floor-space, and develop a large amount of power in proportion to size and weight. A motor of 5 brake

h.p. will occupy a floor-space of only about three by two feet, and weigh about 400 lb. These figures relate to machines running at average speed. Where belt-drive is desired and no floor-space is available, the motor can be easily fixed to ceiling or walls.

For direct gearing to presses a motor is unequalled by any other form of power, and with a little care in design can be so installed that it takes up a very small space outside the press. They also run with very little or no noise or vibration. The last point is of great importance where there is difficulty in putting in a solid foundation, because the attachment of direct motors obviates the need for such.

With regard to control, motors can be started and stopped almost instantaneously, so they need only be worked when actually required, thus saving the waste which other power sometimes causes, owing to the time occupied in starting which means some loss. They can also be easily regulated to give very large speed variations if required.

Recently the push button system of control has been much developed. By this means the actual starting and stopping of the motor is quite automatic, and the plant is operated entirely by the pressing of buttons.

Current can now be largely obtained for power purposes at twopence per unit, in some cases for less (one unit = 1·34 h.p. for one hour). A good motor, with care, has an efficiency of certainly 80 per cent., so that running costs are low.

For driving rotary newspaper machines electricity is rapidly taking the place of all other forms of power. The principal advantages in this case are the ease with which a slow "inching" speed for making ready can be obtained, and the slow and steady manner in which the machines can be gradually run up in speed from, say, 6 revolutions to 600 revolutions per minute of the printing cylinder, thus obviating the risk of breaking the paper in starting. The push button system can be adopted so that the machine may

be started, stopped, and, if desired, speeded up or down from any number of points. These buttons can be connected so as to ring a bell a few seconds before the machine starts.

We are indebted to Mr. Howard Marryat, M.I.E.E., for the following tables showing the horse power required for motor driving, together with the average speed in running.

WHARFEDALES

Name of Machine.	Maximum size of sheet printed.	Horse Power.	Impressions per hour.
Demy Folio	$17\frac{1}{2} \times 11\frac{1}{4}$	$\frac{1}{2}$-1	2,000-3,000
Crown	20×15	$\frac{1}{2}$-1	1,600-2,400
Demy	$22\frac{1}{2} \times 17\frac{1}{2}$	1	1,400-2,200
Royal	25×20	1 -$1\frac{1}{2}$	1,250-1,900
Double Crown	30×20	1 -2	1,250-1,900
Double Demy...	$35 \times 22\frac{1}{2}$	2 -3	1,100-1,700
Double Royal...	40×25	2 -4	1,050-1,600
Quad Crown	40×30	2 -4	1,000-1,500
Extra Quad Crown ...	45×30	3 -4	1,000-1,500
Quad Demy	45×35	3 -5	950-1,400
Extra Quad Demy ...	50×37	4 -5	950-1,400
Quad Royal	50×40	4 -6	900-1,300
Extra Quad Royal ...	55×42	4 -6	900-1,300
Eight Crown	60×40	5 -6	800-1,200
Extra Eight Crown ...	65×40	5 -6	750-1,100
Eight Demy	70×45	5 -8	550- 800

MIEHLE TWO-REVOLUTION

Name of Machine.	Maximum size of sheet printed.	Horse Power.	Impressions per hour.
No. 3	30×43	4	2,200
,, 1	36×52	4	2,000
,, 00	40×55	5	1,900
,, 0000	42×60	5	1,700

PERFECTING MACHINES

Name of Machine.	Maximum size of sheet printed.	Horse Power.	Impressions per hour.
Double Demy...	$35 \times 22\frac{1}{2}$	2 -4	1,050-1,600
Double Royal	40×25	3 -4	1,000-1,500
Quad Crown	40×30	3 -5	950-1,450
Quad Demy	45×35	4 -6	950-1,400
Quad Royal	50×40	5 -8	900-1,300
Eight Crown	60×40	6 -10	800-1,200

MACHINE PRINTING

CHAPTER XXVI

Machine Printing—Methods of Impression, Platen and Cylindrical —Classification of Printing Machines—Some Hints on Laying-down Machines as regards Foundation and Light—Cleanliness and Lubrication—Systems of Making-ready by Hard and Soft Impression.

IN dealing with this subject it must not be forgotten that our mission was to describe more particularly those machines used in relation to bookwork, but the appliances in use for jobbing or newspaper work also claim attention.

Since this work was first issued there have been many improvements made in all classes of printing machinery, and particularly those of the two-revolution character, of which more will be said later on.

Printing by mechanical means is now effected by two methods of impression, *i.e.*, flat and round, the former termed the platen, and the latter the cylindrical. The platen impression is allied to the hand-press, but, owing to rapid improvement in the more true manufacture of the cylinders, the system of flat impression is fast dying out, except in the case of hand-presses or the platen small jobbing machines. Again, as distinct from the two methods of impression, there are two kinds of printing surfaces, *i.e.*, flat and round; and although there are a few rotaries which print from the flat bed, the round printing surfaces are confined to those of the

rotary kind, all others being worked from the flat printing surface.

Classification of machines.—The following list will suffice to give some idea of the various machines actually in use, and the class of work for which they are best suited:

Platens.

Jobbing machines, worked by foot or power, in various small sizes up to post broadside, or even larger.

Single and *double platens* of a larger size, but rarely now used. These were formerly called the *Scandinavian.*

Cylinders.

Single cylinders. One-sided machines, the bulk of which are on the stop-cylinder principle, which means that the impression cylinder is stationary on the return travel of the machine.

Other kinds of single cylinders are the two-revolution machines, where the cylinder rotates twice to each impression. The two-feeder is another kind, where the cylinder reverses on the old "tumbler" principle, and then grips the second sheet on its return travel. Still another is the two-colour machine, more generally made with one cylinder only.

Double cylinders are usually perfecting machines which print both sides of the sheet, but in two distinct impressions before it leaves the machine.

Rotary machines, used mostly for magazine or newspaper work, and usually made to print from the reel or web of paper on the one, two, four, six, or eight-feeder principle. These machines usually print from curved stereotype or electrotype plates, but there are a few machines on the market which print from the flat.

Laying down machines.—An important matter to be considered is the light—artificial means of lighting should only be resorted to in extreme cases, both from an economical

and, what is still more material, from a healthful point of view. Good light means good work. Care must also be exercised that the foundations and surroundings are in keeping with the requirements of the machines. It is usual to have them erected either in the basement or on the ground floor. It is also advisable to have the larger kinds built over pits. This gives additional solidity to the machines, obviates vibration to a great extent, and gives easy access to the under parts when they need cleaning or repairing.

Ample room should be allowed for the purpose of getting round the machine to any working part, and all wheels or exposed dangerous portions should be fenced in. This latter is, in fact, a provision in the Factory Acts.

At the present time nearly all newspapers are printed from rotary machines, stereotype or electrotype plates being curved on other cylinders instead of being flat; the paper employed is generally from a web some miles long. As printed the sheets are cut by the machine, and in most instances folded, counted, and pasted if required. There is also a damping apparatus attached for the wetting of the paper, if necessary, before printing. By this process of printing, after the making-ready has been performed, the production of the printed sheet is purely automatic, save for the watchful care of the machine minder. It is highly necessary that this person should be at once both a printer and of a mechanical turn of mind, considering the great responsibility involved in the charge of one of these valuable and intricate pieces of machinery.

Care of machines.—For the proper working of any machine there are two very essential points to be borne in mind—cleanliness and due attention to the lubrication of the working parts. On no account should dirt or grease be allowed to accumulate. In oiling the parts it is better to give a little and often than to give an excess. For the larger parts requiring lubrication perhaps tallow is the best, and oil for

the smaller. By all means give both to the machine, but sparingly, on starting in the morning. If the holes get clogged a little paraffin should be applied, and the machine run for a short time: this will then have the effect of cleansing it; afterwards it may be oiled as usual. In choosing a lubricant, one must be selected which does not congeal, and is of good quality; the higher-priced ones are generally the best. Next to efficient making-ready the question of proper inking facilities is the most important. It is frequently the case that the ink-ducts are very imperfectly understood. If the keys are regulated as intended, good ink used, and the rollers in condition, the colour, when once set, should be equal and thorough in working. Some machine minders will obstinately refuse to avail themselves of the mechanical means at their disposal for the proper and even taking of ink at each revolution of the machine, preferring often to feed the vibrating and other rollers; this practice is greatly to be deprecated. If the duct is in good working order, no excuse should be tolerated. The minder should be thoroughly conversant with all the details of the machine he is intrusted with, and should seek to improve his acquaintance with the several kinds which he may be called upon to take charge of. A knowledge of mechanics is a great qualification for him, although the construction of the different machines is much the same in principle in all those of the cylindrical character.

It is customary for the makers of the various machines to erect them, and to give any precise instructions on this subject for the purpose is somewhat difficult, considering the number of machines of different patterns in the market, some of them being of so very complicated a nature. Nevertheless, it is essential that the workmen who tend these machines should have some superficial idea of their construction, in order that they may know the cause of any possible defect in the working parts, and later on we give some

illustrations and a key to the parts of a Wharfedale, together with some hints on the erection of that machine.

Remarks on Making-ready.—Before giving any detailed description of the various machines in use in most printing establishments, it will be well for us to dwell a little on the styles of making-ready. The system of bringing-up by under- or over-laying is the same in principle as on the hand-presses, but, as the workman has to deal with a far larger and more complicated machine, there are rules and methods to be followed to compensate for the great difference between the two modes of printing by hand and by more automatic means—these rules and methods differing again according to the nature of the machine used. The present fashion is largely to print with super-calendered paper, which of course is worked dry, by the hard-packing system; the old method of damping the paper and printing with a soft impression is fast losing its hold on the younger generation of printers. In order to adopt the former kind the machine must be in good order and the type not very much worn—if otherwise, hard-packing will not be of much avail in bringing up the type to a true level, and the old style of using the blanket or a sheet of india-rubber will have to be resorted to. Finally, it is highly important that whatever process be adopted, the forme on the first occasion should on no account be pulled or run through by power; the impression should be felt for by turning the machine by hand. Stereotype work especially is likely to become seriously damaged by a first and probably hard impression.

It should particularly be borne in mind that with blocks, with or without type, or works printed from electro or stereotype plates a deal of labour may be saved by an intelligent system of underlaying before the overlaying is attempted. This is where the best men often score over their fellows.

CHAPTER XXVII

Jobbing Work—Ink Distribution—System of Making-ready on these Machines—Lay Marks and Gauge Pins—Class of Platen Machine best adapted for Light and Heavy Work.

WE will now briefly take the jobbing work, assuming it is executed by small platen machines driven by foot or power, which are generally made in size up to post broadside, though larger are sometimes manufactured.

Taking the ordinary *Cropper*, or *Minerva*, fig. 148, for our example, as it is very largely used, it will be seen that the bed or coffin of the machine is in a fixed vertical position. The type is locked-up in special chases, and secured by clamps, which can be readily fastened and unfastened. The platen in working is carried from the almost flat position in front of the operator by two arms, one on either side, and travels to the forme for each copy printed. It is necessary, of course, for the laying-on and taking-off, that this position should be as stated; after due practice an expert feeder can tread the machine and lay on and take off 1,000 copies at least per hour, without fear of accident; if driven by power it is possible to gear them up to a higher speed, but care must be taken in feeding. The impression is regulated, in the more recent machines, by one screw only underneath the platen—this should be interfered with as little as possible. In the older makes of this machine, and indeed most other platens, the impression was altered by means of five screws, one in each corner and another in the centre. In that case

very great care was requisite in getting a perfectly level impression, otherwise the platen was thrown out of the level; therefore the more recent plan is the preferable.

The inking arrangements are placed behind and above the

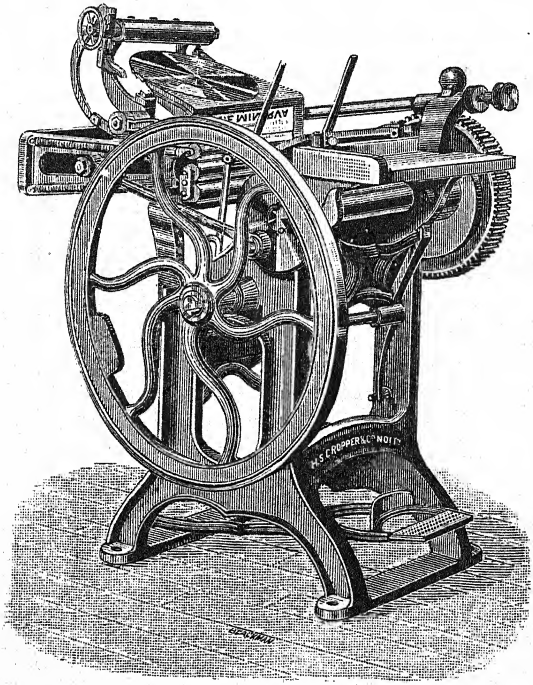


FIG. 148. THE "CROPPER" PLATEN MACHINE.

bed holding the forme, and by an ink-duct, vibrator, and a *distributing disk,* fig. 149, which is made in the present machines, with three inner disks revolving in an opposite direction to the larger and outer disk, ample distributing power is obtained. As the platen falls back from each

separate impression the rollers pass down over the forme and back again. The frame of the machine is now cast in one piece, which gives increased strength and rigidity to the whole. These machines are usually worked by lads, who, with a little instruction and subsequent experience, can be intrusted to turn out a good deal of work, subject only to slight supervision. In making-ready, a thick sheet serves as the top one, and a few thin sheets—three or four—are all

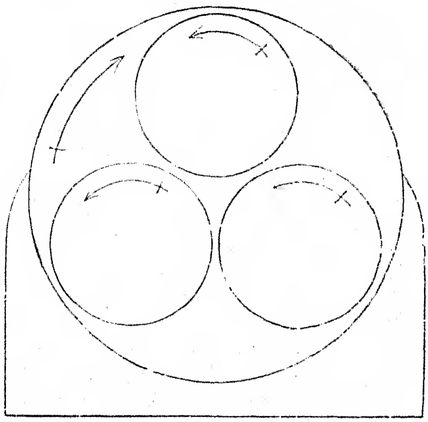


FIG. 149. DISTRIBUTING DISK ON "CROPPER" MACHINE.

that is necessary for packing. The outer and thicker sheet is fastened by being turned in under the thin iron frame which fits lightly round the outer edge of the platen. When the sheets are placed inside, and the impression turned over once by hand, the impression screw can be adjusted as required in order to bring the forme within touch.

Then the making-ready can be proceeded with by cutting-out or patching-up a first, and subsequently a second sheet, if necessary. When this has been done, the lay should be made; if central, place one side of the sheet to the extreme

edge of the print on the top sheet (a faint print, or even blank pull, is sufficient for the purpose). Then the surplus paper, fig. 150, with the other end of the sheet over and above the print, should be folded just in half; this gives the exact centre when marked on the top sheet with a pencil. This

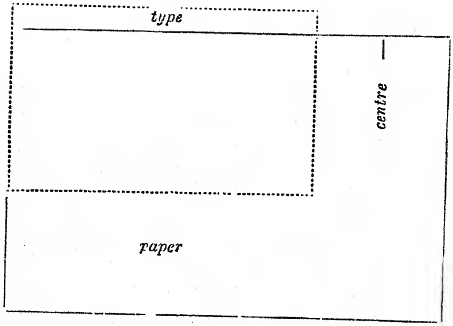


FIG. 150. OBTAINING THE LAY.

rule is a ready one, and applies either to the side or bottom lay.

We have seen produced from these platen machines some of the most perfect specimens of printing. To do this, some experience is required, but whether new or old type, rough

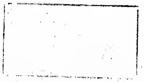


FIG. 151. LAY MARK (CORK).

FIG. 152. LAY MARKS (SPRINGS).

or smooth paper, such a finish can be given that all after-pressing is quite unnecessary. The work can be turned out perfectly flat and sharp in its impression by good hands—it is simply a matter of care in making-ready, and proper amount of impression.

Lay marks.—Pieces of cork, fig. 151, or springs, fig. 152, made of glazed board, are both used for laying to, but in long

numbers they should be carefully watched, as the paper or cards used for the job in hand are likely to cut or wear away that part laid to. There are also *gauge-pins*, fig. 153, to be obtained, of American origin. They are of metal, and consist of a long pin, which is forced through the top sheet. They have two teeth, which are pressed into the packing or making-ready to hold them in the correct position. To assist the sheet in coming away from the forme after printing, fingers or grippers are used; these can be adjusted to any distance on the paper, but it should be seen that they are screwed up tightly and in the proper place, as otherwise they may be pulled across the face of the forme. It is best not

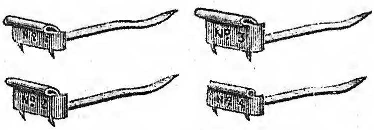


FIG. 153. GAUGE-PINS.

to place them on till the forme has been brought-up and the lay obtained correctly.

In the case of a job being perfected or backed-up, the side-lay should be shifted to the opposite side in order to secure exact register; any variation in the size of card or paper would throw it out if laid to the same side-marks. There are different ways of laying-on and taking-off at the same time, but the operator should accustom himself to laying both sides with equal facility, and keep a very sharp look-out, or he may get his hand caught in the machine whilst in motion. The supply of ink can be regulated to a nicety. There is also a "throw-off" for the impression, used for running-up colour, or in the event of a "miss" in laying-on; this allows of double rolling the forme if it is a heavy one. There is also in most machines an arrangement for holding the rollers up whilst running-up

colour, which does not necessitate the rollers passing up and down over the forme as the platen rises and falls. If a very open or broken forme is on the machine, a frisket can be made to prevent blacks, this being fastened to the fingers and cut away in the parts to be printed.

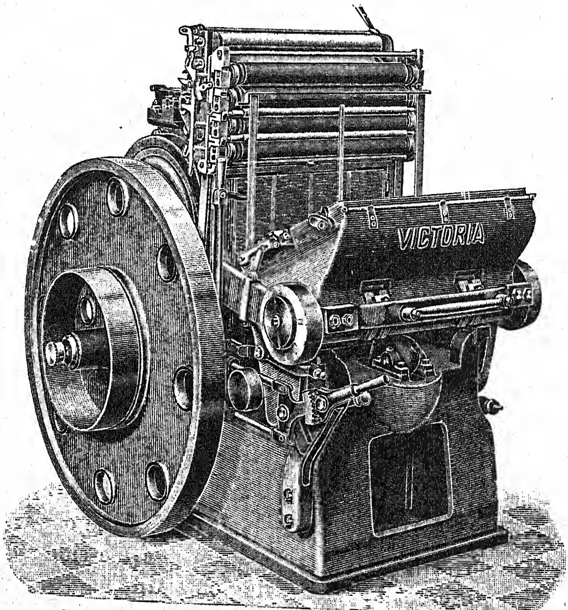


FIG. 154. THE "VICTORIA" PLATEN MACHINE.

There are many other varieties of small platen machines of English, American, and German make; among them are the Universal, Golding Jobber, Phœnix, Victoria, Caxton, Colt's Armory Press, Reddish Jobber, Mitre, Sun, Bremner, Gordon, Little Wonder, Arab, Liberty, etc. In general principle they are much the same, but they vary in several details, and the same remarks apply broadly to all, subject

to the deviations necessitated by the make. Some of these machines are more substantial than others. Whilst the Minerva is admirably adapted for the lighter kind of jobbing

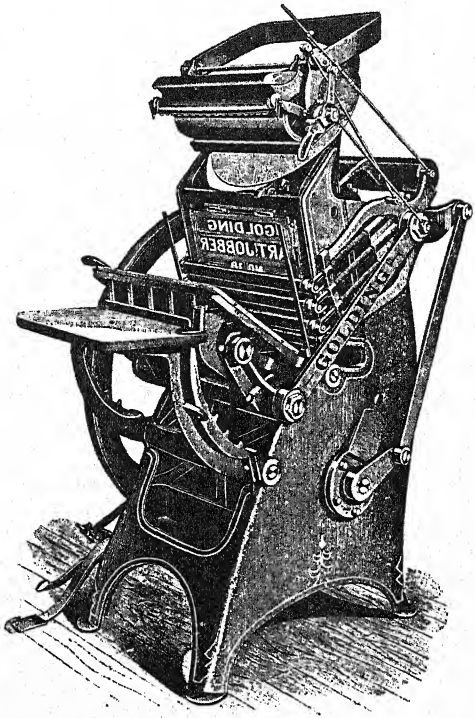


FIG. 155. THE "GOLDING JOBBER" PLATEN MACHINE.

work, the *Victoria*, fig. 154, Caxton, Universal, or the Mitre, are perhaps the best for the heavier class.

The Victoria is particularly adapted for the finest work of all characters, and is made in various sizes up to large

post broadside. It is now fitted with a patent hand guard which will stop the machine should the operator's hand be in danger of being crushed. The inking gear will ink the heaviest forme of half-tone blocks with a single rolling; screws are not used to adjust the impression, but this is done by moving a small gauge. The impression check is so arranged that if a sheet is not fed in, the platen can be checked in such a way that it does not print.

The *Golding Jobber*, fig. 155, is also a good machine for all-round work, and those of later manufacture have been improved on very much in many points. They are light running machines, and comparatively noiseless whilst in action. It is claimed for them that they have many features non-existent in other platens. For instance, there is a good dwell on the impression, and the platen remains down sufficiently long to allow of the sheets being fed in comfortably. The impression is regulated by wedges easily altered, and the throw-off is a simple arrangement actuated by a handle very close to the operator. The facilities for inking have been well studied, the supply being regulated by an automatic brayer-fountain within reach of the printer without going to the back of the machine, and is distributed on a disk which can be adjusted to the requirements of the work in hand.

The machine generally is well balanced in running, so that the smaller or medium sizes can easily be worked by foot if necessary. The parts are all standardized, so that in the event of accident the portion damaged or broken can be readily replaced from stock. The machine can be geared to a high speed, and in connection with this platen it may be mentioned that there is a duplex ink distributor placed beneath the bed which has a lateral movement, thus imparting a different inking surface on the ascending rollers as they return over the forme to the top revolving disk, in order to take more ink.

CHAPTER XXVIII

The Larger Kind of Platen Machine, Single and Double—Making-ready and Mode of Working.

THE larger kind of platen machines, propelled by power formerly, superseded hand-presses to a great extent. They were manufactured either single or double, and in various sizes. A short account of this particular class of machine will not be uninteresting, for in its day it was capable of producing some high-class work and at a greater rate than the hand-press.

To commence with, the *single platen*, fig. 156, was sometimes called the Scandinavian, or "Scan," for shortness. As in the case of a hand-press, the tympan was usually made of parchment, and the frisket formed of brown paper cut out to the necessary shape.

The making-ready was carried out in a manner similar to that explained in the part devoted to press work, and the operators laid-on and took-off respectively—the sheets as printed being placed at the side of the machine on a bank or table. The forme in this single platen machine did not travel, but was a fixture under the platen. When a fresh sheet was laid on and the tympan turned down, the sheet was carried along to a position immediately between the forme-bed and platen, and then impressed by the descent of the platen. The inking arrangements were attached to the front part of the tympan, and passed and re-passed over the forme

as the sheet went in and out for its impression, the fresh supply of ink being obtained from the table at the other end of the machine. The crank action was applied in the working of this machine, and the carriage holding the forme could be easily withdrawn, if necessary, for correction. The rate of speed obtained was somewhat in excess of that of the hand-press.

Of the *double platen*, fig. 157, there were two kinds as regards working action, the crank and the knuckle-joint—

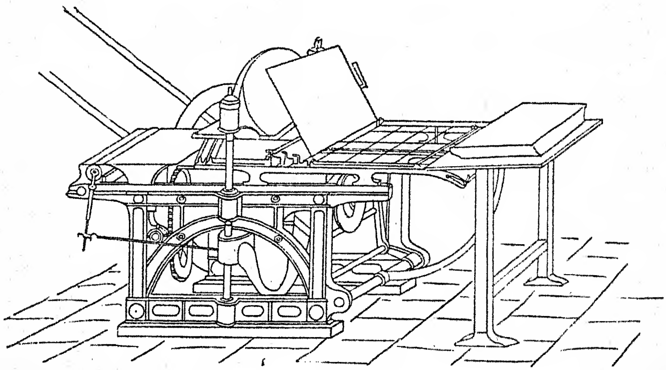


FIG. 156. THE "SCANDINAVIAN" PLATEN MACHINE.

the latter being the more speedy. The illustration we give is that of the crank movement. The double platen had two ends, similar in all respects; these ends were available for distributing and inking purposes, as the formes travelled backwards and forwards. Two formes were placed on the beds at either end, and, as each in turn arrived under the platen, it was impressed, and then returned to its former position to have the sheet removed and a fresh one laid on. A double set of operators was of course required at each end. The making-ready and other details in laying-on and

taking-off were the same as in the single platen or on the hand-press.

Machines on this principle have been discarded for those of the cylindrical character, but they were capable of turning out fairly good bookwork. Their great drawbacks were their slowness of production and their inferiority in inking facilities compared with the more modern make of cylinder machines.

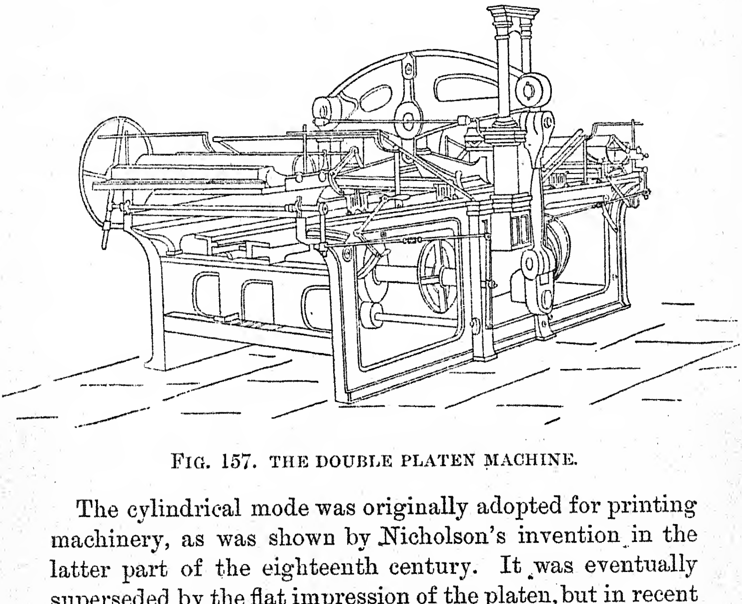


FIG. 157. THE DOUBLE PLATEN MACHINE.

The cylindrical mode was originally adopted for printing machinery, as was shown by Nicholson's invention in the latter part of the eighteenth century. It was eventually superseded by the flat impression of the platen, but in recent years the first plan has come to the front again. Owing to the very great improvement in the manufacture of the cylinder through accurate turning, or, in some instances, grinding, it will probably retain its position as the best method of impression in printing, whether of single or double cylinder, or even rotary kind.

CHAPTER XXIX

One-sided Cylinder Machines: The Wharfedale a good kind—The System of Inking applied to Single-cylinder Machines—Description and Rate of Speed to be attained by the Wharfedale in Working—Geared Inking Apparatus—Making-ready—Finding the Pitch—Hard Packing—Slurring—Packing Rollers—Register—Supply of Ink—Altering the Impression—Key to the Parts of a Wharfedale—How to Erect a Wharfedale.

FOR general bookwork of the shorter numbers in printing, the *Wharfedale* machine, fig. 158, is certainly the best kind and in most demand. It has a single cylinder, and consequently prints one side only at a time. It is built on the stop-cylinder principle, that is, this cylinder is stationary on the return travel of the machine—the locking being performed at each revolution by a push-rod worked off an eccentric cam. The English stop-cylinder is generally fed in from under the cylinder, whereas most American machines of the same character have the high- or over-feed board. Messrs. Dawson's machine, we believe, is the original Wharfedale, but there are several other good machines of the same type in the market, varying little from the one here given (Payne's). They are made in all sizes; their inking and distributing powers are a great feature, as likewise the accessibility to all parts of the machine, and the convenience of laying-on and taking-off. They are simple in construction and do not occupy much space. Very great improvements in various details have been made from time to time. The cylinder can be held completely stationary,

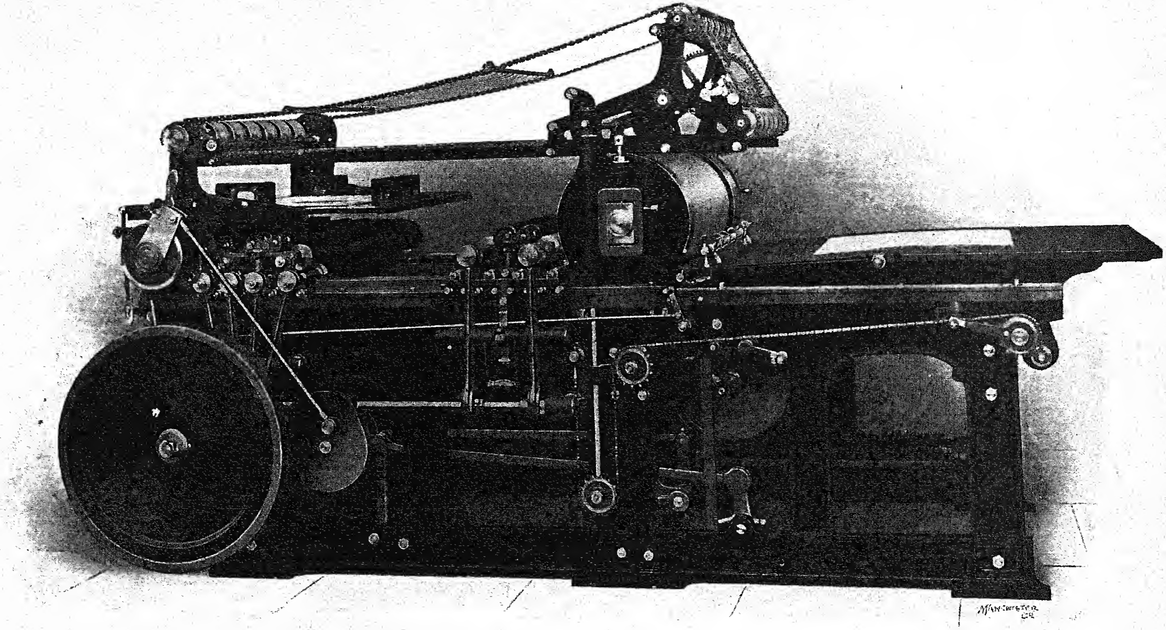


FIG. 158. THE STOP-CYLINDER (WHARFEDALE) MACHINE, FITTED WITH FACE UP FRONT SHEET DELIVERY.

and the inking rollers can be raised whilst the ink is being distributed on the slab. The double rolling action is also obtained with a special cam which stops the cylinder every other time, and automatically keeps the grippers open and the feed board from raising until the cylinder rotates again. By the addition of extra and stronger traverse rails underneath the bed or coffin greater strength and rigidity are given to the whole machine. One other improvement is that of the cutting knife which allows of large sheets being cut in half as fast as printed, for the greater convenience of handling—a consideration with work printed on heavy paper. Thus every facility is given for turning out the different kinds of work which these machines are called upon to execute. Here let it be repeated that a Wharfedale is a stop-cylinder machine; single cylinder and one-sided machine being synonymous terms.

System of inking.—To illustrate the older method of inking as applied to single cylinder machines, the diagram, fig. 159, will be of service, because it is simple and at a glance makes it more clear to the student, whereas those given later on will show the up-to-date system of reciprocating rollers and riders.

Here in this figure are seen the distributing and inking rollers respectively, and the method of taking and giving ink to the forme: (D) is the ink-duct, a shallow trough containing the ink, which is let out by a long thin iron plate, termed the "knife." The quantity of ink to be given at each impression is regulated by screws or keys, turned by the aid of a "tommy"; if properly and consistently done in the first place, equality in colour will be obtained. The ink let out is deposited on the ink-cylinder, a metal roller within the duct, which revolves slightly at each turn of the machine, and from this cylinder the ink is lifted at intervals by the vibrating roller (V). This roller in its action places it on the ink table (T), which travels with the forme

coffin (F), being attached to it; (W) are the wavers, or distributing rollers, which thin out the ink on the table, and as the forme passes and re-passes under the other rollers (I), called the inkers, it receives the necessary quantity of ink; (C) is the impression cylinder. As will be observed, the inkers receive the ink from the table after it has been distributed thereon by the wavers. The ink-cylinder within the duct is kept on the move, a partial revolution at each

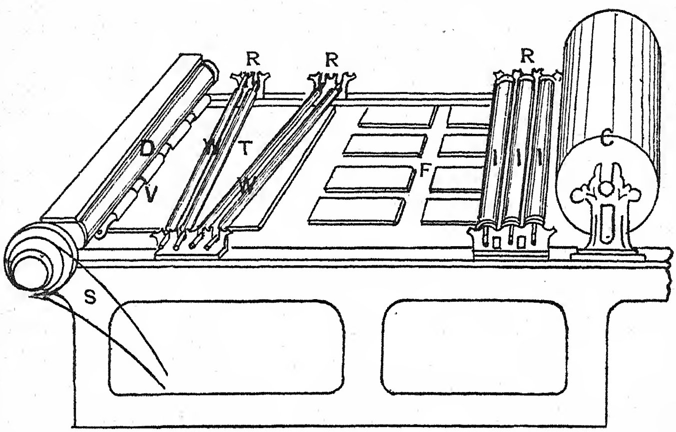


FIG. 159. EARLIER SYSTEM OF INKING ON THE WHARFEDALE.

impression, by a ratchet wheel in connection with the shaft of the machine (S), and the rollers revolve on their spindles, which are held in forks (R), by the travelling of the ink table and forme carriage.

In the Wharfedale machine that end which is occupied by the inking appliances and frame is covered up by the taking-off board, which is a great economy of space; consequently the working parts just enumerated are not in the way when in action. When it is requisite to get at the rollers or to

correct the forme this board is turned up on its end, immediately over the ink-duct, and an iron rack at either side is disclosed; this is for placing the rollers on, if it is necessary to lift them out for any reason. Some machines are made with a high and sliding back board which permits of the forme being got at without having to shift the work or to turn back the taking-off board. The machine as shown in fig. 158 will run off copies to the extent of 1,400 per hour if the speed is regulated by the special pulleys, but it is rather too great a number for good work, or that of a heavy nature; however, 1,000 to 1,200 is a safe number to attain, after allowing for various stoppages, if the work is not of a very special nature.

The gripper arrangement is the same as that used for feeding all machines of the stop-cylinder class.

All machines are now fitted with taking-off apparatus, thus dispensing with some amount of unskilled labour, an item to be considered in large establishments. Several automatic laying-on apparatus for these machines have been introduced in recent years, but as the systems adopted at the present time are somewhat complicated and expensive, we cannot with any degree of certainty recommend them just now. No doubt they will be further perfected in course of time, and the initial cost reduced.

We have taken the Wharfedale as an example of a single cylinder, because we are convinced that this class of printing machine is the best suited for the general run of bookwork, especially that of short numbers. In addition to Dawson's and Payne's machines, there are those of Harrild, Miller and Richard, Furnival, and others; all of which may be relied on for good and sound work. Some have advantages over others, but these when absent are generally compensated for by other good points. One great advantage is to have all the accessories possible.

Wharfedales are made from a small jobbing size up to a size which will print a sheet measuring 85 × 65 in.,

and yet is comparatively noiseless in running. More complete distribution and application of ink is obtained by the use of a system of rollers, all of which are geared in connection with the distributors and inkers respectively. Additional inking is given by the use of a cylindrical reciprocating drum, or geared riders and rollers alternately arranged in pyramid fashion, or even a combination of both methods, as shown separately in figs. 160 and 161 respectively on the next two pages.

Compactness in build, and accessibility in feeding and taking-off are two things in favour of these machines. In proportion to the size of sheet which may be printed, the Wharfedale probably occupies less standing-room than any other class of machine.

Making-ready by the old method.—Assuming the blanket (soft impression) is adopted, the machine minder should proceed to put up the calico next the cylinder. This is fastened at one edge between two flat bars just inside the cylinder at the gripper side. The calico is then carried smoothly round the cylinder and fastened at the other end, and tightened by the ratchet wheel. The object of the calico is to form a basis or foundation for the impression sheets to be pasted on. Some six or eight sheets of thin paper should be placed next—the requirements of the particular machine will teach the exact number—and pasted down. See that these lie perfectly flat. The blanket may then be placed on. In choosing this do not take a thick one, but select a blanket of fine and even texture. The forme-carriage should then be brushed down, the forme placed on, and the correct "pitch" obtained, otherwise the sheet will not be gripped, or the forme may be battered in the first pull.

Finding the Pitch.—The best plan is to daub a little ink on one end of the cylinder opposite the grippers, and turn the coffin under till this mark is transferred to the impression bearer. A gauge should then be cut for future use, and the

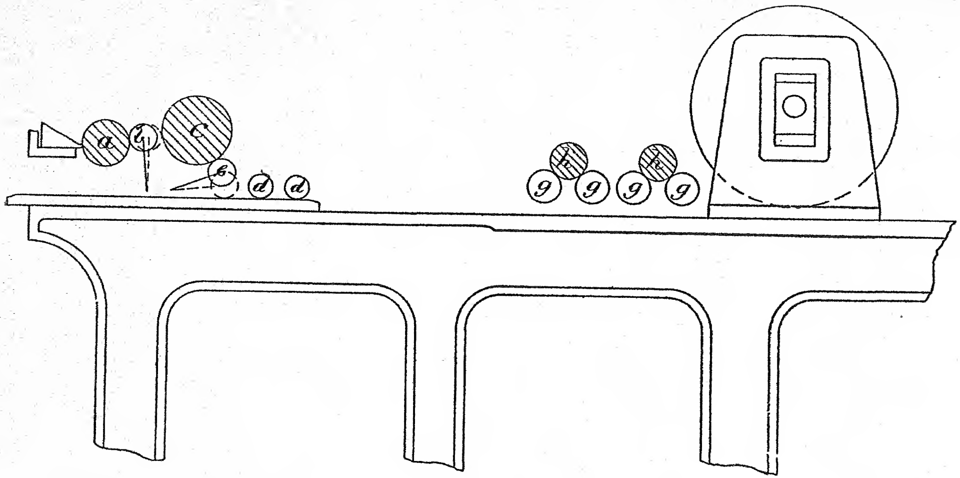


FIG. 160. GEARED INKING APPARATUS, WITH DISTRIBUTING DRUM.

SHADED = METAL, AND OPEN = COMPOSITION ROLLERS.

Distributors.

(A) Metal ink roller.
(B) Composition vibrator.
(C) Metal distributing drum.
(D) Composition rollers.
(E) Composition vibrator.

Inkers.

(G) Composition inkers.
(H) Metal riders.

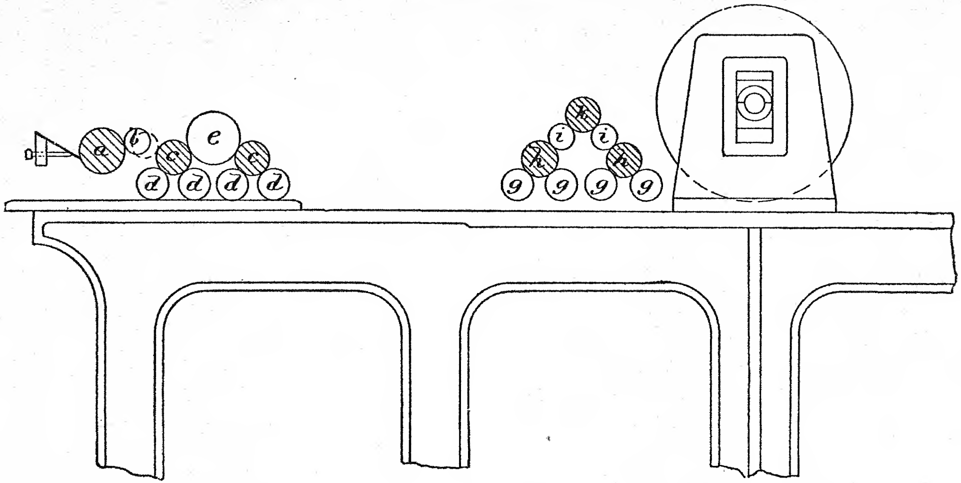


FIG. 161. GEARED INKING APPARATUS, ARRANGED IN PYRAMIDICAL ORDER.

SHADED = METAL, AND OPEN = COMPOSITION ROLLERS.

Distributors.

(A) Metal ink roller.
(B) Composition vibrating roller.
(C) Metal riders.
(D) Composition distributors.
(E) Composition rider.

Inkers.

(G) Composition inkers.
(H) Metal riders.
(I) Composition riders.
(K) Metal Rider.

formes of works of varying margins may be adjusted to the exact position at once without fear of accident.

After the forme has been placed on the coffin and fastened down a sheet may be pulled for register. At the same time, supposing the impression is pretty level, a proof should be taken for final revision by the reader; this obviates delay in starting. If the forme is not within touch, the impression screws at either end of the cylinder may be tightened. If too hard they may be loosened. The next step is to make register, and, if the work is to be pointed, which is rarely necessary now, except in the case of colour work, the two points should be fastened to the forme at both ends for the first side in printing. In sheet work it is advisable to lay the inner one of the two formes on first. Of course these points are not used for the second forme, or, if half-sheet work, they should be lifted when the sheet is backed or perfected. When the pages are registered and the points for the second side adjusted on the laying-on board, an impression sheet may be pulled for making-ready or levelling the type.

It is sometimes more convenient to use a hand roller in performing these operations than to put any rollers on the machine. By adopting this method the machine minder will be enabled to make a good start with the proper rollers when all else is ready.

If there are any cuts in the forme to be printed, see that they are first underlaid so as to bring them up to a level with the type, for by doing this, much time in making-ready will be saved.

The necessary patching-up and cutting-out should be executed in the same manner as detailed in the part of this book devoted to press work. When the making-ready of each single page has been affixed to its proper position, additional touching-up can be done on the cylinder.

The revise being passed, the ductor should be seen to, and the requisite supply of ink regulated by the keys. The

rollers being put in their respective places, colour may then be run up, and a few waste sheets sent through the machine so as to distribute the colour evenly on the table and rollers before making an actual start.

Hard-packing system of Making-ready.—This plan dispenses with the blanket, and few sheets only are necessary between the type and cylinder, with a stout hard sheet of paper or milled card—a glazed board is an admirable substitute—placed next to the cylinder. Unless the machine is in good order, and the type fairly new, this method is not advisable, for it would entail a deal of labour; but given these two points, the machine minder may adopt it.

Illustrated work printed on super-calendered or coated papers lends itself to this class of printing, and the cut-work in current magazines is all produced by this system.

To dress the cylinder for this method, some prefer that a stout card or board should be first stretched over the cylinder, as the calico is in the other style of making-ready. Great care should be taken that it lies perfectly flat and close; to assist this the board may be scored right along on the top, a short distance from the edge, to allow of it turning more easily into the opening of the cylinder. When fixed, place two or three sheets of thin paper, and, lastly, one of a stouter kind, which will serve as the top sheet. If the whole is not firmly fixed, slurring will probably result; therefore it is requisite that the board with the following sheets be lapped round very tightly. These details having been performed satisfactorily, the making-ready may proceed as usual.

As before said, if the machine is in fair condition, and the type new or little worn, not much time will be required in putting the finishing strokes to a forme preparatory to starting, provided the forme has been brought within touch by the proper number of sheets placed on the cylinder in the first place.

The object of printing by this method is to obtain a sharp, hard, and clean impression, without being heavy. If these points have been attained, cold-pressing or rolling of the sheets afterwards will not be needed. Two other essentials in this system are that a good quick-drying ink be used and the paper be perfectly smooth. For the printing of illustrations a super-calendered paper is necessary, and in some cases coated papers.

The following remarks on making-ready, which have been reduced from the "British Printer," may be read with interest, and these apply largely to the printing of all illustrated books or magazines by the hard-packing system.

The forme being ready, it is put on the machine, and then planed down; if it shows signs of being springy, slightly slacken the quoins, plane it gently, and then re-lock. There is generally too little thought given to planing a forme. Some do not think of planing a forme until they have finished locking it up. The result is that in nine cases out of ten it is sent down to the machine springy or off its feet. If it falls into the hands of a careless machineman, he will not trouble himself to unlock it, so as to plane properly, but will hammer away, and when tired, he will proceed with the job and wonder why it wants such a deal of patching and cutting away in making-ready. Should there arise any necessity for unlocking the forme after he is ready for a start, it will probably be found to require half making-ready again. What should be done is to get the type to stand down solid at first, care being taken not to plane across blocks and type at once. An impression may then be pulled.

Underlaying the blocks is a process requiring careful attention. A good deal depends upon its proper performance. All blocks must be as nearly level with the type as possible. If too high, the result is rapid wear to the fine lines and general rounding of all sharp shades, giving the engraving,

after a little use, a flat and thick appearance. Besides this, the overlay cannot be kept so effective, and after a run of a thousand or two it becomes flattened out, with the danger of drawing up quads. One thickness is used to bring level, as near as one can guess it, hard material being used and not ream wrappers. If not high enough, or too high, do not be afraid of the trouble of raising the forme again. In underlaying use, say, 30 lb. double crown, sometimes thinner. It is often the case that the wood mounts are not level on the top, next to the plate. This is troublesome, and if an attempt be made to remedy it at the bottom, the block will perhaps rock, bringing up quads all round. It is important that the block should stand as level as possible, and if still showing hollow in the middle, or irregular at the surface, then the plate should be raised, if practicable, and an underlay slipped in between the plate and the mount. If this cannot be done without risk, it should be brought as nearly level as possible by overlaying on the cylinder, care being taken to bury the overlay under as many sheets as possible, so as to hide any sharp edges.

In preparing the cylinder hard packing is used. The cylinder takes about nine sheets of 40 lb. double demy, all told. Five sheets of 40 lb. are put on with a sheet of 32 lb. on the top, the sheets being pasted along the front edge and fastened direct upon the cylinder. No calico is used, the packing being secured at the back by gummed paper, care being taken to draw the sheets taut. The remainder of the nine sheets are added in the process of making-ready. Some workmen use damp sheets on the cylinder, but the great drawback to this method is that it is not always convenient for the machine to stand until the tympan is thoroughly dry. It is useless to begin making-ready on a tympan that is not dry, because as it dries it contracts. The machineman oblivious of this fact will keep on patching up the type, and yet cannot understand how it is that his

overlays have moved. All the paper used for packing should be dry.

For overlaying, a sheet is fed through, with the amount of sheets on the top of it that will bring up the pressure required—two sheets of 40 lb. double demy are generally reserved for this—and an impression is pulled. If it is a heavy forme and requires a little more pressure, an additional sheet is put on the cylinder. An impression is then taken on the top sheet, from which headlines, leaders, rules, and hard parts of illustrations are cut out.

Having done this, a sheet of 18 lb. is drawn over, another impression taken, and the overlay sheets prepared. These consist of three sheets of 18 lb. and one about 10 lb. heavier. They are cut up into single pages, along with one on the paper of the book, and then the making-ready begins. The bottom page in the corner is taken first, and so on. All hard parts are taken out of the top tympan sheet, and the weak places in the type overlaid and pasted to it, tissue paper being extensively used, so as to avoid any unnecessary pressure. In the illustrations, the machineman must use his own judgement in cutting out, some cuts requiring more than others. Some light shades, especially ground and sky, or outside lines, require to be lightened, according to the subject illustrated. The artistic machineman will do well to make his mind familiar with light and shade and perspective, as exampled in good engravings. In the general run of machine illustrations, the light shade is taken out of one of the 18 lb. double crown sheets, then the second shade out of the next, and then the third for number three, using the thicker sheet for solids. The solids are pasted directly on to the cylinder and then number three. This is better than pasting the overlays all together, and then putting on, as the solids are thus well buried and prevent sharp edges around them. When overlays are pasted together, the solids should be pasted to the undermost overlay. In placing the

thin overlays together, the "rule of thumb" system is to paste each all over and stick together; but there are objections to this. When done in that way, it is found they cannot be got together accurately—they have expanded whilst damp and have been unequally drawn out during the process of pasting. Having cut out sheets one and two, the proper method is to paste the solids on first and then to lay number two over number one, just touched here and there with paste to hold them together. The same with the third sheet. In landscapes, photos, sea views, and other fine illustrations, the one, two, three order is not strictly followed—the aim being to throw the subject up well. Much can be done to improve the appearance and the effectiveness of views by an additional overlay on a house or tree, or other features intended to be prominent in conveying a clear idea to the mind. Again, a bit cut out here and there will help to make an ordinary block look better, while a really good one can be made to look like a fine picture. After having cut out overlays and finished patching up, another sheet of 18 lb. is put over all, and a few waste sheets run through, or one placed on the forme, to set the overlays, etc. An impression may now be pulled on a sheet of its own paper, with the tympan sheet on top as usual,—this being a sheet of the 40 lb. double demy. Any remaining defects are now remedied on the top sheet, and, this being done, one 40 lb. sheet is pasted on to cover all in. A sheet having been passed, a start is made with the printing.

In printing-off, the changes in the weather affect the ink and rollers to a great extent. Formes which will work well one day will sometimes cause a deal of trouble the next, this being especially the case with coloured inks. The supply of ink should be set so that it will fairly cover the solids without thickening the fine shades. The sheets, as they are printed, are interleaved to prevent setting-off. On printing the other side, the cylinder is oiled to stop off-setting, but the tympan

is not soaked through, the oil being vigorously rubbed into the top sheet with a soft rag. Some printers do not like the oiling process, because, in their case, it has shown on the back of the printed matter. The fault is their own; the oiling has not been done properly. Too much oil has been used. It is only the top sheet that requires oiling, not the whole of the tympan. A rub over with a clean rag should be given, and a sheet run through a few times. In backing the work, the interleaving sheet is taken away as the feeder takes up each separate sheet, but the perfected sheets are interleaved, as in the first instance. They are then allowed to dry, and, having stood the necessary time, the completed sheets are removed from the interleaves.

In conclusion it may be added that this system of hard packing removes the necessity for rolling and pressing.

Slurring in printing.—The possibility of slurring through inefficient packing of the cylinder, whether by the old or new style of making-ready, has already been pointed out, but it is also sometimes caused by the natural wear and tear of the machine—the cylinder having become out of truth by constant running. If this is the case, the wooden cylinder bearers which run on either side of the coffin must be packed up with pieces of card. Tacking down these cards opposite the pages of type will relieve the edges of the pages considerably, and obviate the slurring, although this plan is only a make-shift.

Packing the rollers.—This is sometimes necessary, on the older makes of machines, to avoid the "wiping" of the roller on the extreme edges of the type, which causes an excess of ink on the part where the rollers pass over any opening between the pages of the forme. In order to get over this difficulty thick cards, or even pieces of leather, may be used as packing; the length should be a little more than the opening to which they are placed opposite. Let the extreme edges be bevelled off so that the rollers will

run over without jumping. The exact height will be determined by experience, but generally a sixth or an eighth of an inch in thickness is sufficient. All this can now be obviated by the adoption of geared rollers and riders.

Register in printing.—This is attained either by pointing or by simply laying each sheet with very great care. For ordinary bookwork the latter method may be adopted if a very careful layer-on is engaged. To perform this correctly the second side in printing should be laid to the reverse end of the feeding-board; that is, the same edge of the paper must be laid to on the second side as in the first one printed, but to another mark on the off-side of the machine. To do this it is sometimes best that the layer-on should go to the other side of the machine, in order to secure greater accuracy in register, but this should not be necessary if the layer-on is a competent one. Colour work and other particular formes or closely-set pages should be printed with points, and registered on the second side by pointing, and not merely by laying to a mark at the reverse end.

Proper supply of ink.—Keep the ductor perfectly clean, and do not tamper unnecessarily with the keys. If allowed to become dirty the keys get clogged, and will not act properly. This causes an irregular supply of ink to be given out, and unevenness of colour in printing is the result. To assist the proper distribution, it is sometimes necessary to cut the vibrating roller into sections; that is, certain pieces should be cut out at intervals to correspond with the openings between the pages. These excised pieces should be a trifle wider than the type openings. By this method the possibility of an excess of ink to those parts is reduced. In cutting the roller use the knife in a slanting manner, and do not go too deep, or else the suction or lug of the ink table will pull the remaining composition off the stock.

Altering the impression of the cylinder.—This should not be interfered with more than can be helped, as the cylinder

is likely to be thrown out. Formes of various kinds and of a broken nature require different impressions, and sometimes more than can be compensated for by altering the number of sheets on the cylinder. Where it is actually necessary to alter the impression screws of the cylinder do so consistently and evenly at both ends—if done carelessly it will be difficult to make correct again, and will perhaps injure the machine.

In laying on a fresh work select a solid forme for the first working; this will set the machine properly, and the subsequent formes will not be so much trouble in making-ready.

It will be obvious that the machine minder's duties are of a responsible nature, when we consider the value of the machine of which he is in charge. It is his business by forethought to keep the machine running as much as possible. For instance, whilst making-ready let him see that his final revise is passed, and that his boy is occupied in his spare time in cleaning up the machine. The necessary lubrication should now be applied, and the rollers got into condition and position for working. Care should be taken that the coffin and forme are quite clear, and that nothing has been left lying about which might injure the machine in running under the cylinder.

Everything should have a place, so that it may be found when wanted, and each machine should be separately furnished with tools, in the shape of mallet, shooting stick, and hammer, besides the usual accessories, viz., spanners, tommies, etc.

As already proposed, we give here a series of illustrations, figs. 162 to 165, showing all the parts of Messrs. Payne's stop-cylinder machine, together with a numbered key and some general directions as to the erection of this machine, which apply more or less to others of the same character, but subject to the varying details of manufacture.

Key to the Parts of a Wharfedale Machine

Fig. 162.

43. Left-hand bowl rail.
44. Left centre bowl rail.
45. Right centre bowl rail.
46. Right-hand bowl rail.
47. Table.
54. Ink slab.
55. Cylinder.
64. Ductor knife.
74. Flyers.
82. Duct roller.

Fig. 163.

6. Bottom rack.
7. Bottom rack.
8. Right horse-leg.
9. Left horse-leg.
10. Left large driving wheel.
11. Right large driving wheel.
12. Gripper cam.
13. Connecting rod.
14. Right-hand traverse wheel.
15. Left-hand traverse wheel.
16. Protection motion, board and double roll cam.
17. Left-hand cam-shaft bracket.
18. Right-hand cam-shaft bracket.
19. Double rolling bell crank.
20. Cylinder incline lever.
21. Left-hand board lever.
22. Right-hand board lever.
23. Check gripper bell crank.
24. Gripper incline lever.
25. Live wheel incline.
26. Left-hand board lift.
27. Right-hand board lift.
28. Gripper incline.
29. Long wedge.
30. Protection cam lever.
31. Board cam lever.
32. Double rolling cam lever.
33. Gripper cam lever.
34. Brake and pusher cam.
35. Pusher cam lever.
36. Board lever connecting rod.
37. Double roll lever connecting rod.
38. Gripper lever connecting rod.
39. Brake cam lever.
42. Vibrator cam lever.
48. Right vibrator arm.
49. Left vibrator arm.
50. Driving shaft and brackets.
51. Bowl carrier.
52. Bowl carrier.
53. Board lift shaft.
72. Left-hand lay-on board bracket.
76. Banjo rod.
77. Vibrator connecting rod.
81. Striker handle.
83. Right-hand cam-shaft.
84. Left-hand cam-shaft.
92. Ink regulator segment.
105. Shaft for balanced flyers.
114. Chain wheels for flyers—fix on [frame.
115. Lock-up bar.
116. Rubber boss bar for flyers.

Fig. 164.

1. Left-hand frameside.
2. Right-hand frameside.
3. Driving end cross-frame.
4. Centre cross-frame.
5. Feeding end cross-frame.
80. Flywheel.

Fig. 165.

40. Vibrator cam.
41. Banjo foot.
56. Live wheel.
57. Left-hand cylinder stand.
58. Right-hand cylinder stand.
59. Pusher and rod.
60. Brake wheel.
61. Cylinder brake bracket.
62. Right duct bracket.
63. Left duct bracket.
65. Left delivery board bracket.
66. Right delivery board bracket.
67. Left side geared inking stand.
68. Ramshorn for geared inking.
69. Right side geared inking stand.
70. Right-hand rack guard.
71. Left-hand rack guard.
73. Right-hand lay-on board bracket.
75. Balance weight for flyers.
78. Striker rod bracket.
79. Driving gear guard.
85. Shafts for bowl carriers.
86. Protection motion springs and [plungers.
87. Short wedge.
88. Brake connecting rod.
89. Cylinder incline and gripper lever [shaft.
90. Cylinder check handle.
91. Cylinder stop.
93. Pump handle.
94. Duct ratchet.
95. Duct connecting rod.
96. Striker shaft.
97. Worm wheel shaft for geared [inkers.
98. Lifting shaft for flyers.
99. Eccentric bush and stud.
100. Vibrator shaft.
101. Traverse wheel shaft.
102. Inking roller sockets.
103. Striker fork.
104. Striker connecting rod.
105. Shaft for balanced flyers.
106. Banjo pinion.
107. Geared inking rack.
108. Cylinder racks.
109. Front lays.
110. Smoothers for lay-on board.
111. Plate to hold up long wedge.
112. Banjo pinion guard.
113. Chain wheels for bottom of flyer [shafts.
117. Duct regulator.
118. Pulleys.
119. Support for geared inking rack.

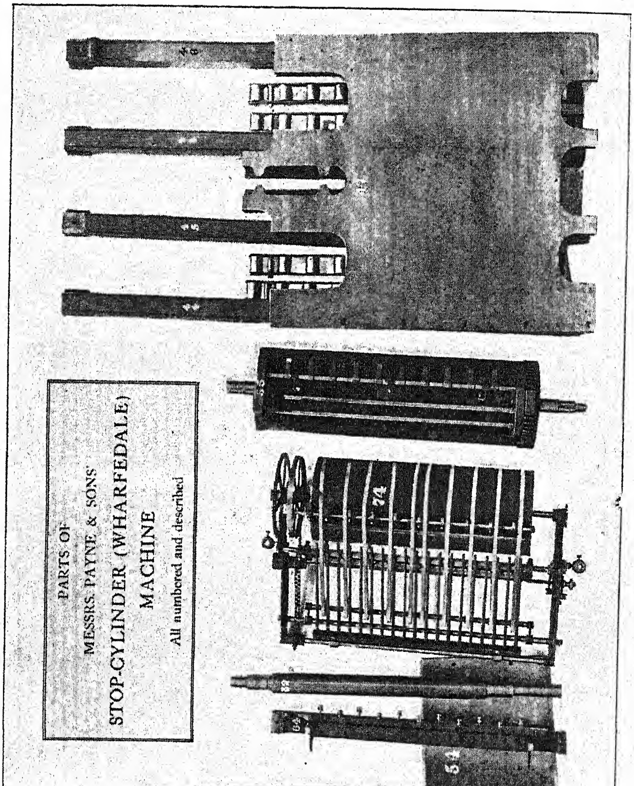

PARTS OF
MESSRS. PAYNE & SONS'
STOP-CYLINDER (WHARFEDALE)
MACHINE
All numbered and described

FIG. 162.

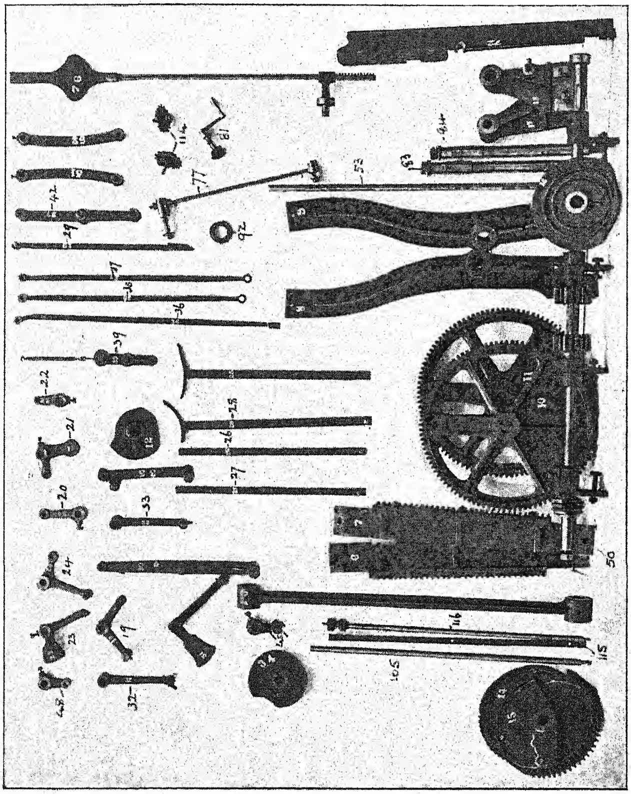


FIG. 163.

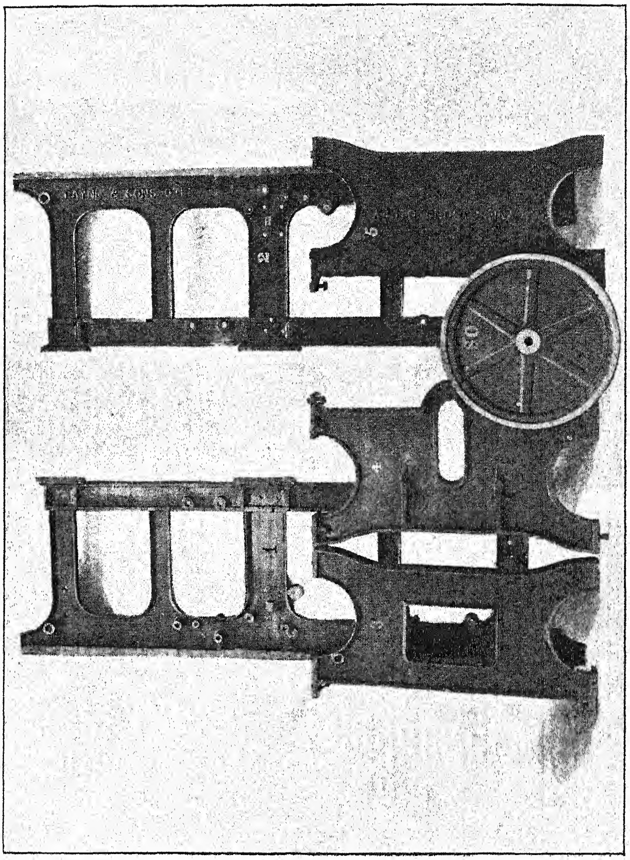


FIG. 164.

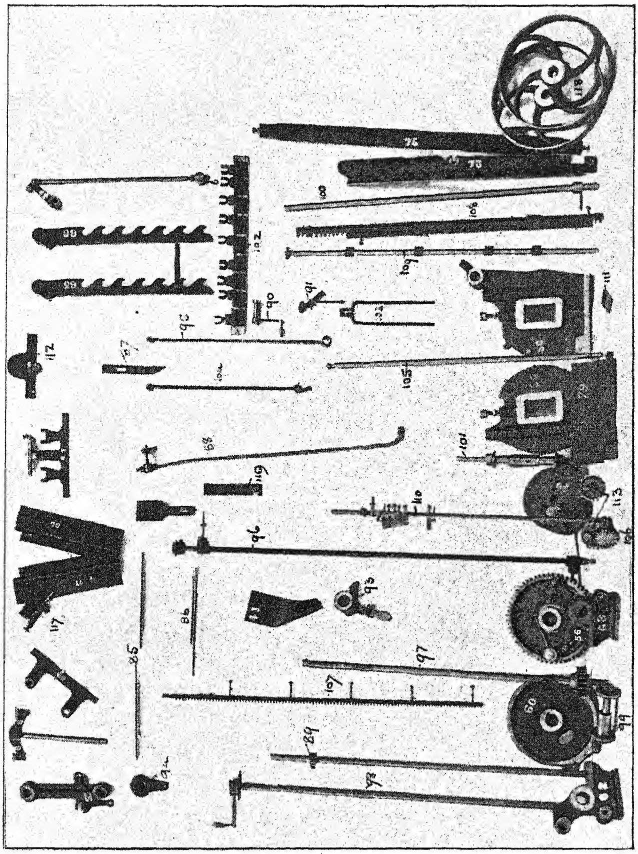


Fig. 165.

How to erect a Wharfedale. Take right frameside, bolt the three cross-frames to it. Then bring and bolt up left frameside. If little room put in shafts Nos. 53, 89, and 98 before fixing left frameside. Put in bottom racks between centre and feeding cross-frames and horse-legs between centre and driving end cross-frames. Place right and left cam-shafts in holes in right and left horse-legs. Slip protection cam (16) on left shaft; put bracket (17) on shaft; bolt to frame. Slip gripper cam on right cam-shaft; fix on bracket (18). Take large driving-wheels and put them on taper ends of right and left cam-shafts. Make sure nuts are tight. Take connecting rod, put traverse wheel shaft (101) through larger hole, place right and left traverse wheels on right and left ends of shaft; bolt up. Lift on to machine so that connecting rod is through centre cross-frame, and traverse wheels are in marked gear in bottom racks. Put eccentric bush (99) through other end of connecting rod, the bolt through bush and large driving-wheels. Place thimble and spring in vertical hole inside left frame. Put stud of cylinder check handle (90) through hole in frame; place on handle outside. Put short wedge on thimble, the bolt in slot of wedge through frame and short spring and plunger (86) at back of wedge. Place cylinder-incline and left board-lift through slots in left frame. Take long wedge, put protection cam-lever (30) on pin of wedge, set wedge against frame under lump on cylinder-incline; fasten lever (30) to bottom of frame; long spring plunger keeps (30) against cam. The board and double roll cam-levers go on same stud on left frame. Lever (20) and crank (19) go on shaft at cylinder-incline, No. 20 on the incline; (23) and (24) go on other end of same shafts. The gripper-incline and right board-lift go in slots in right frameside. Levers (21) and (22) go on board-shaft, (21) working left lift and (22) the right. Couple up gripper, double roll, and board, connecting rods. Fix striker shaft and handle (96) on left frame. Put on driving shaft, flywheel, and bowl rails.

Place bowls on rails, couple by means of (85) and bowl carriers to traverse wheel shaft. Put on table; see travel is correct to marks; level up machine. Put on cylinder, live wheel to left side, put on live wheel and cylinder stands, put on cylinder stop to right stand. Set stud for brake in right frameside, and pusher cam on outside end of right cam-shaft, put on levers (35) and (39), place pusher on stud, couple to cam-lever, put on brake wheel and brake. Put on duct and vibrator gear, vibrator cam on outside of left cam-shaft. Place shaft (105) through cylinder-stand vertical holes, put chain wheels (113) and (114), and chains in position over wheels on shaft (98), which goes through holes in extreme feeding end of frames; put flyers on top of (105). Put inking stand, etc., geared inker-rack, boards, and guards on. Fasten long cylinder-rack to table on left, see that it gears correctly. See that cylinder is in position to take a sheet, *i.e.*, against the stop; fasten short cylinder-rack on right side, put on cylinder bearers, etc., pulleys, strap, fork, etc.

The two-revolution machine is another one of single cylinder style, and the *Miehle*, fig. 166, is a good example of the kind. This machine is manufactured at Broadheath Works, Altrincham, Cheshire, by Linotype and Machinery, Limited. It is of American origin, but is largely used in this country, especially for illustrated magazine and high-class colour work. As in most other machines of American design, it has the high overfeed board. The taking-off apparatus is automatic, but on a different plan from that of the Wharfedale, as will be seen from the illustration—the sheets being carried over tapes, the freshly printed side uppermost, thus preventing smearing; they are then carried on to the heap or pile by the frame or long arms placed at the end of the machine. Face-down delivery is also provided.

A feature in connection with the Miehle machine is the tandem equipment, whereby two, three, or even four machines may be coupled together for colour work. Only

one layer-on is required, and register is obtained automatically throughout.

The principle of the two-revolution is that the cylinder always rotates in the same direction, and twice for each copy produced, once for the actual impression, and again for the return of the forme carriage. There are many new features claimed for this particular machine; one is that it is so constructed that the movement which governs the action of the type-bed in reversing is so arranged that the strain common to some other machines is considerably reduced; another point is that its registering in printing is good, register having been a weakness in many of the older makes of two-revolutions, owing to the particular method of gearing adopted, the cylinder generally being geared apart from the type-bed, which was apt to be thrown out occasionally. Great strength is imparted to the frame, and the type-bed is particularly rigid. These advantages, together with a very truly turned cylinder, and careful means of adjustment, much simplify the necessary preparation or making-ready of any forme for printing, which is performed much in the same way as for any other single cylinder machine. It may also be mentioned that the inking facilities have been well provided for.

There are various other two-revolution machines of reliable manufacture to be obtained, and Hoe's, Furnival's, the Century, the Centurette, and the Cottrell are worthy of mention.

The *Perceler*, fig. 167, is a two-feeder machine, but is also made as a one-feeder. From the illustration, which is that of the former kind, it will be observed that it has only one cylinder but with two feed boards and an inking arrangement at both ends. Under the cylinder the type-bed runs as usual, taking the necessary ink from either end, which is applied by the inkers situated respectively on both sides of the cylinder, as it travels to and fro. The travel of this

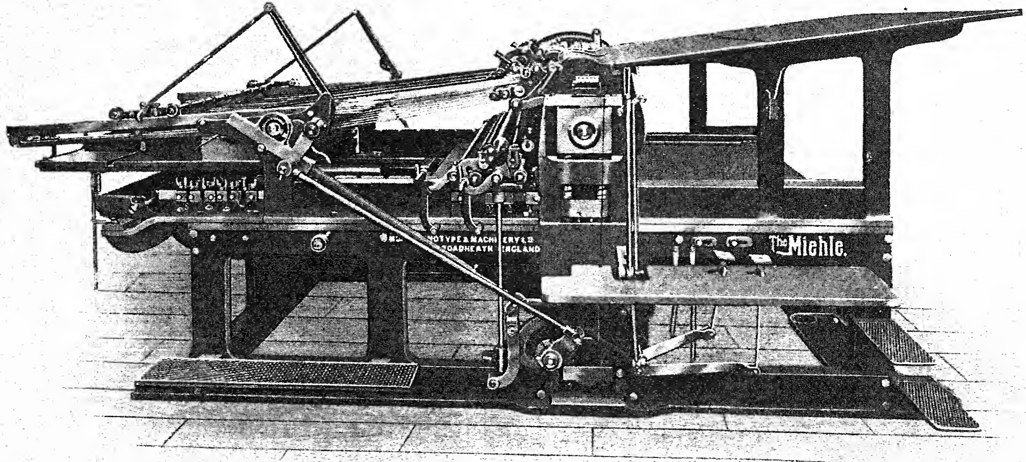


FIG. 166. THE MIEHLE TWO-REVOLUTION MACHINE.

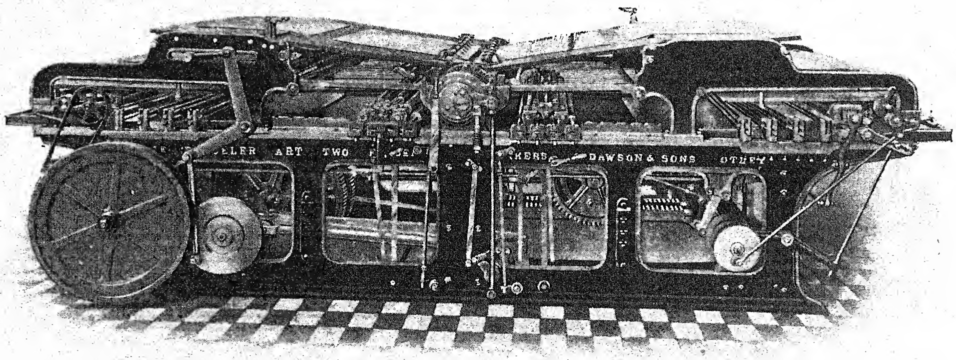


FIG. 167. THE PERCELER TWO-FEEDER MACHINE.

machine naturally is somewhat longer than that of the single feed. The cylinder is so arranged that it reverses at each run, on the old "tumbler" principle, and the grippers open at the respective taking side as required. It runs easily and quickly, and is well adapted for turning out good illustrated magazine work. This machine can easily be converted into a single-feeder for temporary purposes, but of course in either case it must be seen that there is a certain limitation in the sizes which can be produced from any one machine built to a certain specification. For instance, one made for quad demy will print down to quad crown as a two-feeder, and when used as a one-feeder, in any reasonably smaller size. This, however, is no great objection, because such machines are generally constructed for special work of given dimensions. It is claimed that it will produce 1,250 copies from either end, but certainly 2,000 copies per hour should be produced as the double output if the work engaged on is not of a difficult nature.

Two-colour machines are also nearly always of the single cylinder kind. The two colours are printed each at one revolution, as the cylinder rotates twice in its travel, from the formes placed on the bed at each end of the machine as they pass in turn under the cylinder. It is at the two ends that the inking apparatus is situated. In comparison it is a longer machine than the Perceler two-feeder just mentioned, the size of the printed sheet being the same for each. This is necessary to allow the two formes to pass under the cylinder, both in its travel forward and on the return. The cylinder stops on the return travel; in fact, it might be termed a double stop-cylinder machine, with the inking facilities arranged somewhat on the same plan as that used for the two-feeder. It should be obvious that these machines are mainly intended for long printing runs, and that short numbers can be worked separately with advantage on the ordinary single machine.

CHAPTER XXX

Double Cylinders or Perfecting Machines: The Web, Drop-bar, and Gripper Varieties—Set-off—Making-ready—Speeds of Perfecting Machines.

PERFECTING machines, with two cylinders, are those which print both sides of the sheet before it leaves the machine, but with two quite distinct impressions, and are adapted for ordinary bookwork of long numbers. As the sheet is fed in, it is carried round one of the large cylinders (E) on to the small register drums placed over and between the two larger cylinders. By this means the sheet is presented on its reversed side to the second large cylinder (E), and receives the backing or perfecting impression. Thence it is discharged on to the taking-off board (D), situated below and between the two impression cylinders. The exact course of the sheet may be likened to a serpentine track; by this means the unprinted side of the sheet can be printed in turn.

The sectional drawing of the machine, fig. 168, now shown will exhibit its working. The reference marks given are necessary for the proper understanding of the parts not only of this machine but for some of those of the rotary kind described in the next chapter, viz.:

P Paper.	E Impression cylinders.
L Laying-on board.	C Cutting rollers.
W Damping apparatus.	F Flyers.
T Type cylinders.	I Inking apparatus.

D Delivery board.

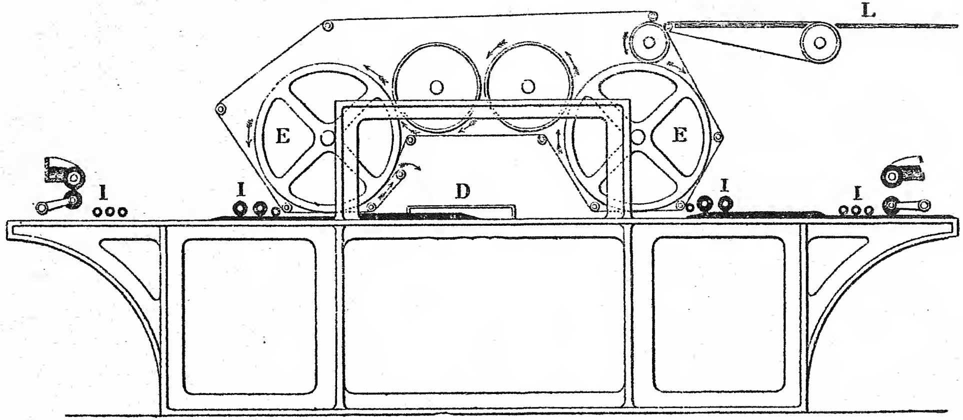


FIG. 168. DOUBLE CYLINDER PERFECTING MACHINE.

The different varieties of actions used for perfecting machines are of three characters, and are described below:

The Web.—Each sheet is laid separately to back-marks on to a series of tapes, and is carried forward. This class of machine is consequently slower in production, owing to the time taken in lifting and carrying each sheet from the heap to the impression cylinder.

The Drop-bar.—In this machine the heap of paper is brought nearer, and the sheets are simply stroked up to certain marks. They are then seized by the bar, which rises slightly, and conveyed to the impression cylinder.

The Gripper.—This method allows of the sheets being taken by a series of fingers called grippers, after having been stroked forward from the adjacent heap up to the front marks. These last two kinds of feeding are now generally adopted, but perhaps the gripper arrangement is more satisfactory in obtaining a correct lay, a greater speed being also attained.

These machines have a series of complicated tapes necessary to carry the sheet in the course of its travel from the feeding to the taking-off board, which with a little trouble may be readily understood.

Set-off on these machines is a difficulty which must be guarded against. We should have said that usually the inner forme is printed on the first impression cylinder (E) nearest the feeding board (L), and the outer is printed on the other large cylinder just before discharging the sheet on to the delivery board (D). To avoid set-off long strips of paper, a trifle wider than the pages, and as many strips as there are rows of pages, are pasted so as to form endless bands, which are placed round the outer cylinder and a small drum. These keep on the move with the action of the machine, and all off-set is deposited on them. If these set-off bands are made of oiled paper they will last for some time without renewing—that is, for some few reams.

Making-ready on these machines is performed much in the same manner as that described for the single cylinder, but the parts are not so accessible, and, again, the inking arrangements are often not quite satisfactory. When running they require close attention, owing to the number of tapes employed for carrying the sheets round the respective cylinders and the liability to set-off.

The speed of these machines varies from 1,000 upwards, but there are some in the market, of the gripper kind, which are said to turn out nearly 2,000 copies per hour perfect.

Perfecting machines have been made with one large impression cylinder only. One side having been printed, by a clever arrangement the sheet is reversed, and then the second side is printed on the return of the forme carriage.

Having treated of the several kinds of machines mostly in use for bookwork and magazine work, both plain and illustrated, *i.e.*, single cylinders of various characters, and double cylinders for printing both sides of two sheets, we now propose just to touch on a few of the rotary machines in use at the present day, giving one of Messrs. Hoe's latest productions of quadruple size, among others of the older make, so that the student may form some conception of these somewhat complicated machines.

CHAPTER XXXI

Rotary Machines: Hoe's—The Victory—The Marinoni—The Whitefriars—Their Working Parts, Capabilities, and Speeds.

ROTARY machines are of various kinds, and, as will be seen at a glance, very different in construction from all other classes of machines, and, in fact, each differs very much in shape and appearance from others built on the same principle. These machines print, as a rule, from the web, or endless paper, but some may be used with separate sheets. We have selected a few examples to enable the student to grasp the main principles, although rotary printing does not as yet really apply to the production of books. Printing surfaces either of stereotype or electrotype plates are curved to the requirements of the cylinders of the particular machine on which they are used. Frequently they have a special stereotyping plant issued with them, the size of the cylinder necessitating a certain curve in casting the plates. Occasionally, as already explained, some of these machines are made to print from the flat, and either type or plates may be used.

These machines are adapted for periodical or newspaper work owing to the great output of which they are capable. Some are really wonderful specimens of mechanical contrivance, all the various operations—wetting, when necessary, feeding, printing both sides, cutting, folding, and pasting, including wrapping—being purely automatic. With such appliances the newspaper of the present day is produced, and they have had the effect of expediting and multiplying

to an almost unlimited extent the number of copies issued, and have been the means of cheapening the cost to the public.

The person in charge of one of these machines must necessarily be a thoroughly practical man, with a decided turn for mechanics, and one who has had a wide experience in the trade. Such a workman is sought after and commands a high wage, generally more than in any other branch of the trade.

Rotary machines of various kinds are made specially to order, so as to cope with the particular class of work in view. They may be built on the "deck" principle either for one, two, three, four, or even more reels of paper, and either in single width, that is, two pages wide, or double width, that is, four pages wide. The machines, however, in general use are those of the single, double, quadruple, sextuple, and octuple kind, and so on according to requirements.

Single and two reel machines are usually arranged with the reel of paper at one end of the machine, and the web passes through the printing cylinders to the folder at the opposite end where the copies are delivered.

Three and four reel machines have also been constructed in this manner, but the more usual and popular arrangement of the latter type of machine is to place two two-reel presses end to end with the folders between them and the reels at the opposite ends of the machine.

This arrangement makes it possible to operate them as independent machines, or to run in combination with each other when copies with a greater number of pages are desired. Another advantage is that it allows of an alternative use of either folder in case of an accident to the other.

When presses are made double width, a two-reel machine is known as quadruple, a three-reel as a sextuple, and a four-reel as an octuple machine.

Double sextuple and double octuple machines are made, having six and eight reels respectively.

One other point in favour of this class of machine is that a four-reel on the two-deck principle with centre delivery is more easily got at in the making-ready than a four-reel straight-line machine built in four decks.

As already explained, rotaries made in single width print two pages side by side, and a double one four pages across —thus a double will produce exactly twice as much as one of the single kind—a great consideration for newspapers of large circulation.

The particular rotary machine shown on the next page, fig. 169, is one made by Messrs. R. Hoe and Co., and is a right-angle quadruple Newspaper Perfecting Press. This is only one of the many varieties produced by that well-known firm.

This machine prints from two reels of the double width. The first reel, as will be observed, is placed to the right of the machine near the floor level, and the second reel is situated at the back of the left-hand portion, and at a right angle to it, and is somewhat obscured by the folding apparatus and delivery boards which are on the front of the left side of the machine.

This quadruple is now made to produce 60,000 copies per hour of 4, 6, or 8 pages; 30,000 of 10, 12, 14, or 16 pages; and 15,000 of 20 or 24 pages all in the same time. The papers are printed both sides, folded, counted, and pasted if desired.

The four cylinders seen to the right are the printing and impression cylinders respectively, the two inside ones being those giving the impression, and the two outer those bearing the printing surfaces. The inking arrangements are placed at the two extreme ends of these four drums, thus being near the printing cylinder in each case. As the paper is unwound from the reel below it travels between the two lower cylinders and one side is printed; then in serpentine

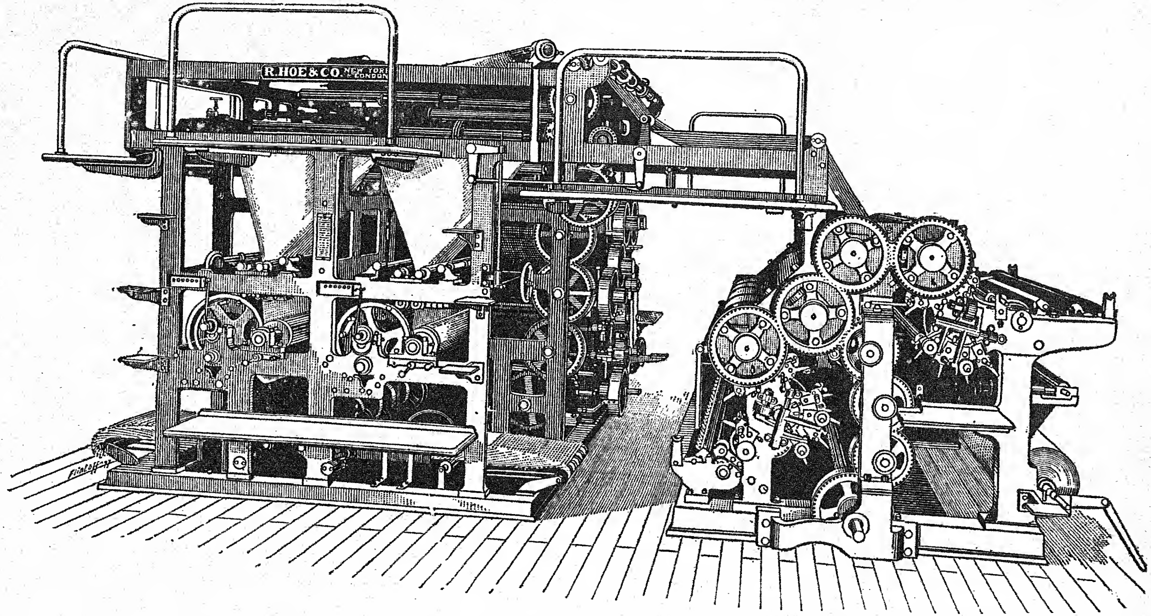


Fig. 169. HOE'S QUADRUPLE NEWSPAPER PERFECTING PRESS.

Y

manner it passes between the second and third drums which are impression cylinders only. It is then carried between the third and fourth which print the second or reverse side of the paper.

From this point the long sheet travels overhead to the left-hand side of the machine, where it is cut longitudinally and divided, and associated with other webs similarly printed by the other press. They then descend into the two different folders, where they are folded and cut—the copies being discharged on to the delivery boards situated at the two sides of the left-hand portion of the machine.

This description, as already indicated, refers to one half of the machine only, and whilst this is in operation the same thing is being repeated precisely by the second half, which is placed at the back of the left-hand portion.

There are several other kinds of rotary machines on the market, somewhat similar in general design but differing in various details. Amongst others may be mentioned Messrs. J. Foster and Sons', the Victory, the Goss Printing Press Co., and that of the Northern Press and Engineering Co., Ltd., as being up-to-date rotary machines printing from the reel. The Cox-duplex and the Cossar are also good machines, but they are both built on the flat-bed principle, and are mentioned here as being examples of that class.

In order to give the student some idea of the older forms of the rotary class of machine, we give a few other varieties, of the single reel kind, which will show the progress made in that direction during the past few years. Although these machines are mostly superseded, their design and principles in working are interesting to note at the present time.

For instance, we have the *Victory* rotary, fig. 170. This was a single reel printing machine which received very considerable patronage. It was particularly noted for its folding apparatus, and was considered one of the most complete machines in the market. It had a good damping appliance,

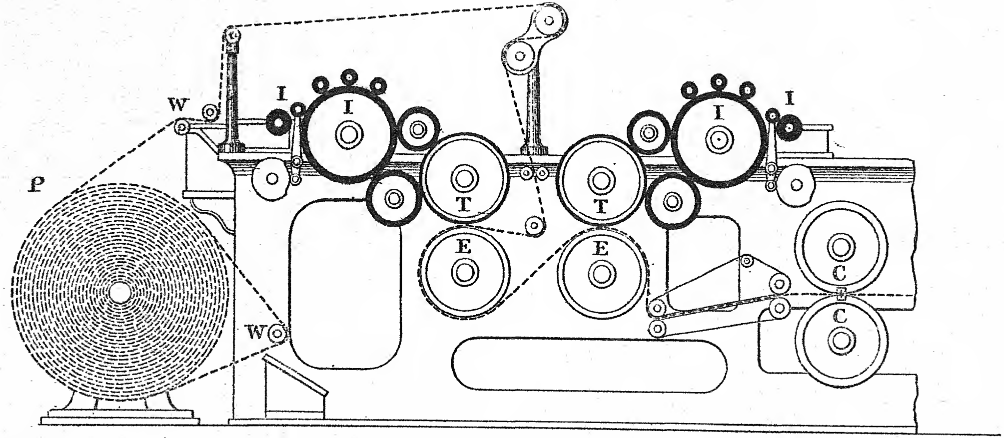


FIG. 170. THE VICTORY SINGLE REEL ROTARY MACHINE.

and the papers were printed, cut, delivered, and folded, it was said, at the rate of twelve thousand per hour.

The type (T) and impression (E) cylinders were arranged in the centre of the machine, the printing surfaces being placed on the top. The working was as follows: The paper (P) after being damped was conducted to the first impression cylinder (E) over small rollers, which acted as "smoothers," when it was printed on the first side. It then passed to the second impression cylinder, and was printed on the reverse side. Thus perfected, it was carried along to the cutting cylinders (C), and thence conveyed to the folding apparatus, which was in duplicate, and received the papers as cut alternately, depositing them in the boxes at the other end of the machine, not shown on the plan given.

The wetting apparatus (W), usually worked by fine jets of water, which were emitted from a series of pin-holes in a pipe, is to the right of the reel of paper, and the inking cylinders (I), with their respective vibrating and inking rollers, will be observed on the top of the machine at either end, the ink-cylinders acting as distributing surfaces.

The dotted lines give the exact progress of the paper in all the diagrams.

This machine has now been improved on very much, and is made to print with more reels, and on the straight-line or centre delivery principle.

The *Marinoni* rotary machine was made by the French firm of that name, fig. 171. As will be seen, it had four cylinders arranged in a perpendicular manner, and printed from the single reel. The two middle cylinders (E) are those which gave the impression, and the other two (T), on top and bottom, are those on which the curved plates were fastened. At the extreme ends of these cylinders were the inking appliances (I); the distributors here had a lateral movement, through a cam action. As they were printed the sheets were collected and passed through the cutting drums (C), situated at the

left centre of the other cylinders. When five sheets had been cut, they were carried along and deposited on the delivery board (D).

This machine printed at the rate of ten thousand perfect copies per hour, and was largely used for the printing of newspapers before the English and American manufacturers made a speciality of this class of machine, although both

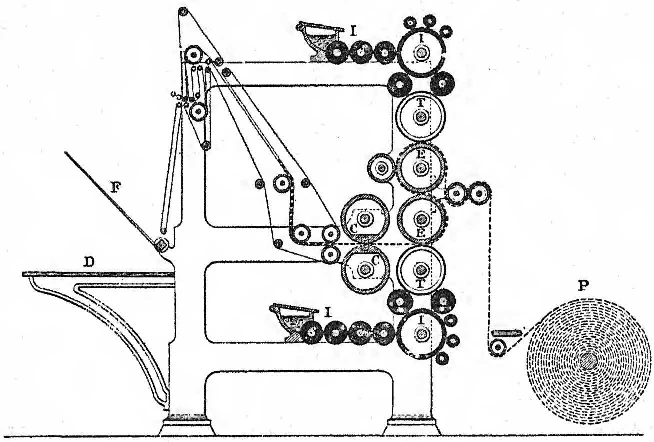


FIG. 171. THE MARINONI SINGLE REEL ROTARY MACHINE.

Messrs. Hoe and M. Marinoni were equally well patronized by the newspaper printers of this country.

Sometimes a folding apparatus was attached, necessitating an alteration in delivering the sheets.

This machine also had a damping apparatus, and the paper travelled between smoothing drums before it passed to the first type cylinder.

In fairness it must be stated that the late M. Marinoni produced many other rotary machines of various kinds, and several containing special features.

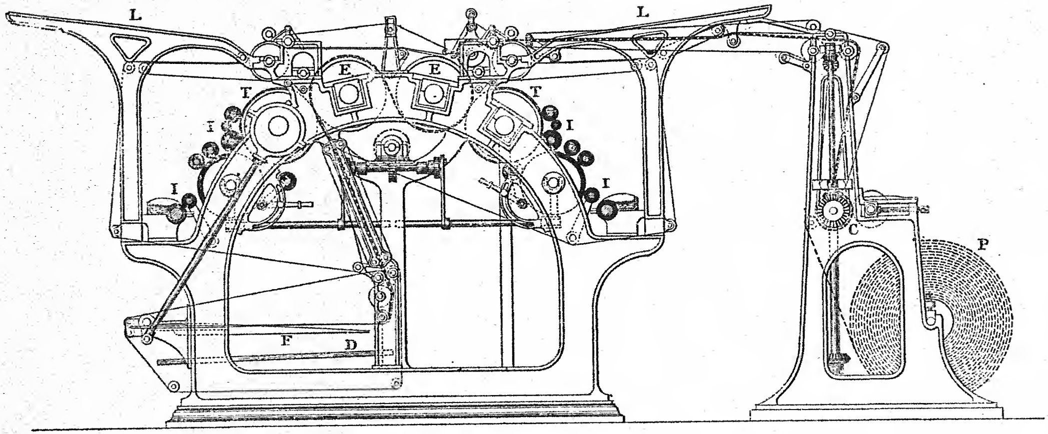


FIG. 172. THE WHITEFRIARS SINGLE REEL ROTARY MACHINE.

The *Whitefriars* rotary machine, fig. 172, was invented by Messrs. Pardoe and Davis, and was adapted for newspaper or magazine work, plain or illustrated. It printed either from the reel or from single sheets, and came to the front owing to the various improvements made in it from time to time. The rate of production was greatly enhanced if the reel arrangement was used. As a two-feeder using single sheets it produced four to five thousand sheets per hour. The alteration in method of printing from sheet to reel, or *vice versa*, was a very simple matter, the portion to the right hand being dispensed with in the latter case.

It had four cylinders arranged round an arched frame marked (T) and (E) respectively, and was last built quite on a different plan from other rotaries, as will be seen from the illustration. When used for single sheets, the feeding boards (L) were placed on the top of the machine at each end. The inking apparatus (I) was placed at the extreme ends of the arch. The sheets after being impressed on both sides were carried to the flyers (F), and then laid smoothly on the delivery board (D) underneath and in the middle of the machine.

The diagram given is that of the two-feeder for single sheets, with the reel arrangement, when used, attached as at the right-hand side of the illustration. A folding apparatus was used occasionally, which was situated at the other end of the machine. The cutting rollers (C), when used for web printing, were placed just above the delivery board (D).

WAREHOUSE WORK

CHAPTER XXXII

The Warehouse Department—Varieties of Machine, Mould, and Handmade Papers—Number of Sheets comprised in a Ream—Tables of Sizes, Equivalent and Relative Weights, etc. - Cards—Qualities and Sizes of the same.

THIS department is responsible for paper—printed and unprinted, the latter being known technically as "white" paper, irrespective of its shade or colour. The head warehouseman should be a capable person, for much depends on the warehouse department, if it is a large establishment, in the proper care and account of stock. Every sheet and ream of paper should be accounted for from the time it enters the warehouse till it leaves the charge of the warehouseman printed and finished for the bookbinder. He should have a thorough knowledge of papers of various kinds, both as regards quality and size. This knowledge is also important to the student.

Papers may be classed at once as either handmade, mould-made, or machine-made. These are all further subdivided into drawing, writing, and printing-papers, and of two characters, "wove" and "laid." Handmades are usually identified at sight by the rough or natural deckled edges of the paper on the four sides, and machine paper generally from the fact that the edges are cut straight. But as both mould-made and antique machine papers are made with raw edges, it is difficult for the inexperienced to identify them, especially the mould-made kind.

Handmade papers can often be told from those made by machine by the circumstance that they are darker in tone on the right side, and the latter darker on the wrong side. The right and wrong sides of paper can easily be detected by comparison, the rougher of course being the wrong one. To discriminate between laid and wove papers—hold up a sheet to the light, when it will be seen that the former exhibit wire marks, which are absent in the latter. This is a rough and ready rule, and correct in general practice.

Drawing and writing papers are principally made of rags (the amount of the same regulating the quality of the paper), with a considerable addition of size to permit of the article being used for the purposes indicated.

Mould-made papers have deckled edges on the four sides of the sheet, and are an admirable substitute for real handmade papers; in fact, in some respects they are even better in finish, for there is not that irregularity in substance or texture as in that made by hand. This is provided the material is really good, and there is no reason why the "stuff," as it is called, should not be equal to that of real handmade, provided the customer will pay for it. As its name implies, it is made in a mould, and by machine; consequently the cost of production is less, and this also accounts for the greater regularity in substance. Papers made by this method can be distinguished by a careful examination of the deckles—these edges generally being less rough or irregular than those of sheets made by hand.

Printing papers, except the better qualities, contain little or no rag, and are made from other substances, chiefly esparto, both hard-sized and soft-sized. The soft-sized papers can be detected by wetting the corner with the tongue, when the moisture will spread as in a piece of blotting or plate paper, both of which are quite unsized. The more a paper is sized the harder it is. There are two methods of sizing adopted, viz., tub and engine sizing; the former is generally

used for handmade papers, and the latter for those made by machine.

The principal properties of papers are that they should be strong, though not harsh, and that they should be as opaque as possible.

The introduction of process blocks, especially those of the half-tone kind, during the past few years has necessitated the use of very smooth papers, and sometimes coated ones, which are dubbed "art" papers. That these papers do give effect to half-tone illustrations must be admitted, but unfortunately the paper is objectionable to the sight and also in handling. Moreover there is always the knowledge that these papers have no enduring properties from the fact that the preparations used for coating are of a mineral character and are bound to degenerate in a few years. On the other hand, although super-calendered papers are not so objectionable, yet, if too soft-sized, they absorb the ink and leave the illustration flat and lifeless.

A ream of paper of the printing class usually consists of 516 sheets = 21½ quires of 24 sheets in each—termed "perfect" or "printers'" reams—this plus of 16 sheets being allowed for spoilages and over copies for every 500 sheets. Handmade papers, whether drawing, writing, or printing, are as a rule made up to 20 quires of 24 sheets = 480 sheets, but sometimes this varies, and reams have 472 or 500; in these cases they are styled "imperfect" reams. "Mill" reams have 472 sheets, and "inside" reams generally 480 sheets. There are different ways of packing—a ream may be either "flat," "folded," or "lapped." The meaning of the first is obvious; the second is when a certain number of sheets is simply folded in half (or "quired"), and the third when the two ends are doubled over without being absolutely folded, thus forming a parcel lapped in three—this is only done with the larger sizes of paper. "Bundles" of paper are two reams done up in one, and a "parcel" is a term

applied to the whole make when an order is given for a certain quantity. "Retree" is indicated by × × (two crosses), "outsides" or "broken" by × × × (three crosses), which imply that the papers are respectively of second or inferior quality, the last being perhaps torn or broken in the "make"—as the manufacture is technically termed.

Some suggestions for testing papers.—Different qualities of paper are tested by various means. The strength is measured by its resistance to tearing. In machine papers the strength and stretching power vary according as the force acts lengthwise or across; in handmade papers there is little difference. In the former the difference is in the proportion of 2·3, according to the direction of the tearing force. The stretching power acts inversely on the strength, that is, is greater across than lengthwise.

Paper as a rule is made to standard sizes, some varying with the different makers; the list now appended shows the average sizes of most printing papers in use:

SIZES OF PRINTING PAPERS.

	Inches.		Inches.
Pott	$15\frac{1}{2} \times 12\frac{1}{2}$	Quad Pott . .	31×25
Foolscap . . .	$17 \times 13\frac{1}{2}$	Double Post . .	32×20
Post	20×16	Quad Foolscap .	34×27
Demy	$22\frac{1}{2} \times 17\frac{1}{2}$	Columbia . .	$34\frac{1}{2} \times 23\frac{1}{2}$
Medium . . .	24×19	Double Demy .	$35 \times 22\frac{1}{2}$
Royal	25×20	Atlas	36×26
Double Pott .	$25 \times 15\frac{1}{2}$	Double Medium	38×24
Double Foolscap	27×17	Double Royal .	40×25
Super Royal . .	$27\frac{1}{2} \times 20\frac{1}{2}$	Quad Crown .	40×30
Double Crown .	30×20	Quad Post . .	40×32
Imperial . . .	30×22	Double Imperial	44×30

In addition to these papers, others are made in double and quadruple size. The following table exhibits at a glance the equivalent weights of papers in certain sizes:

EQUIVALENT WEIGHTS OF PAPERS.

Demy.	Double Foolscap.	Royal.	Double Crown.	Imperial.	Columbia.	Atlas.
lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
12	14	15	18	20	25½	28½
14	16	17½	21	23	29½	33
16	18½	20	24	26½	34	38
18	20½	22½	27	29½	38	42½
20	23	25	30	33	42½	47½
24	27½	30	36	39½	51	57
28	32	35	42	46	59½	66½
32	36½	40	48½	53	68	76
36	41	45	54	59½	76½	85½
40	46	50	60	66	85	95
45	52	50	67½	74	95½	106
50	57½	62½	75	82½	106	118½

For instance, 12 lb. demy is the same thickness in handling as 14 lb. double foolscap, 15 lb. royal, or 18 lb. double crown, and so on.

Paper is also made in endless reels or webs, some miles in length, for the requirements, principally, of newspaper or magazine work printed on rotary machines. As will be seen from the foregoing table, papers are made to definite weights—a given number of pounds avoirdupois to the ream, whether it contains 472, 480, 500, 508, or 516 sheets. Machine-made papers, including mould-made ones, can be adjusted to a nicety as regards weight in manufacture, but handmades vary somewhat, and, owing to that circumstance, are frequently charged by poundage instead of by the ream.

The table on the opposite page gives the relative weights of reams of paper containing 480, 500, or 516 sheets. To find the equivalents of other weights not given there see p. 337.

Relative Weights of a Ream containing 480, 500, or 516 Sheets.

Ream of 480 Sheets.	Ream of 500 Sheets.		Ream of 516 Sheets.		Ream of 480 Sheets.	Ream of 500 Sheets.		Ream of 516 Sheets.	
lb.	lb.	oz.	lb.	oz.	lb.	lb.	oz.	lb.	oz.
7	7	4	7	8	39	40	10	41	15
8	8	5	8	9	40	41	10	43	0
9	9	6	9	10	41	42	11	44	1
10	10	6	10	12	42	43	12	45	2
11	11	7	11	13	43	44	12	46	3
12	12	8	12	14	44	45	13	47	5
13	13	8	13	15	45	46	14	48	6
14	14	9	15	1	46	47	14	49	7
15	15	10	16	2	47	48	15	50	8
16	16	10	17	3	48	50	0	51	9
17	17	11	18	4	49	51	0	52	11
18	18	12	19	5	50	52	1	53	12
19	19	12	20	7	51	53	2	54	13
20	20	13	21	8	52	54	2	55	14
21	21	14	22	9	53	55	3	56	15
22	22	14	23	10	54	56	4	58	1
23	23	15	24	11	55	57	4	59	2
24	25	0	25	12	56	58	5	60	3
25	26	0	26	14	57	59	6	61	4
26	27	1	27	15	58	60	6	62	5
27	28	2	29	0	59	61	7	63	7
28	29	2	30	1	60	62	8	64	8
29	30	3	31	3	61	63	8	65	9
30	31	4	32	4	62	64	9	66	10
31	32	4	33	5	63	65	10	67	11
32	33	5	34	6	64	66	10	68	13
33	34	6	35	7	65	67	11	69	14
34	35	6	36	8	66	68	12	70	15
35	36	7	37	10	67	69	12	72	0
36	37	8	38	11	68	70	13	73	1
37	38	8	39	12	69	71	14	74	3
38	39	9	40	13	70	72	14	75	4

The following tables of sizes, weights, etc., of various papers in different qualities are all useful in connection with the warehouse department, but it is important to remember that some makers vary a little in their sizes. Those sizes which are now given are average ones.

Equivalent Sizes of Writing and Printing Papers and Cartridges.

Description.	Writings.	Printings.	Cartridges.
Emperor	72 × 48	......	......
Antiquarian	53 × 31	......	......
Double Imperial	......	44 × 30	44 × 30
Double Elephant	40 × 26¾	......	40 × 26
Atlas	33 × 26	36 × 26	......
Colombier	34½ × 23½	34½ × 23½	......
Imperial	34 × 22	30 × 22	30 × 22
Elephant	28 × 23	30 × 23	28 × 23
Super Royal	27 × 19	27½ × 20½	27½ × 19½
Cartridge or Log	......	......	26 × 21
Royal	24 × 19	25 × 20	25 × 20
Medium	22 × 17½	24 × 19	......
Demy	20 × 15½	22½ × 17½	22 × 17½
Music Demy	......	20¾ × 14⅜	......
Large Post	21 × 16½	......	......
Copy	20 × 16	......	20 × 16¼
Post	19 × 15¼	20 × 16	......
Foolscap	17 × 13½	17 × 13½	......
Pott	15 × 12½	15½ × 12½	......
Sheet and Half Pott	22½ × 12½	......	......
Sheet and Third Cap	22 × 13¼	......	......
Sheet and Half Cap	24½ × 13½	......	......
Sheet and Half Post	......	23½ × 19½	......
Double Foolscap	26½ × 16⅝	27 × 17	......
Double Crown	......	30 × 20	30 × 20
Double Post	......	32 × 20	......
Double Demy	......	35 × 22½	35½ × 22½

EQUIVALENT WEIGHTS PER REAM OF WRITING PAPER OF VARIOUS SIZES.

Foolscap, 17 × 13½.		Pinched Post, 18½ × 14¾.		Post, 19 × 15¼.		Large Post, 21 × 16½.		Extra Large Post, 22½ × 17¾.		Royal, 24 × 19.		Super Royal, 27 × 19.		Imperial, 34 × 22.	
lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.	lb.	oz.
7	11	9	7	10	1	12	0	13	14	16	0	18	0	22	14
8	5	10	4	10	14	13	0	15	0	17	6	19	8	24	13
9	0	11	1	11	12	14	0	16	3	18	11	21	5	26	11
9	10	11	13	12	9	15	0	17	5	20	0	22	10	28	10
10	4	12	10	13	6	16	0	18	8	21	6	24	1	30	8
10	14	13	6	14	4	17	0	19	10	22	11	25	9	32	7
11	9	14	3	15	1	18	0	20	13	24	0	27	1	34	5
12	3	15	0	15	15	19	0	21	15	25	6	28	9	36	4
12	13	15	12	16	12	20	0	23	2	26	11	30	1	38	2
13	7	16	9	17	9	21	0	24	4	28	0	31	9	40	1
14	2	17	6	18	7	22	0	25	7	29	6	33	1	41	15
14	12	18	2	19	4	23	0	26	9	30	11	34	9	43	14
15	6	18	15	20	2	24	0	27	12	32	1	36	1	45	12
16	0	19	11	20	15	25	0	28	14	33	6	37	9	47	11
16	11	20	8	21	12	26	0	30	1	34	11	39	1	49	9
17	5	21	5	22	10	27	0	31	3	36	1	40	9	51	8
17	15	22	1	23	7	28	0	32	6	37	6	42	1	53	6
18	9	22	14	24	5	29	0	33	8	38	11	43	9	55	5
19	4	23	11	25	2	30	0	34	11	40	1	45	1	57	3
19	14	24	7	26	0	31	0	35	13	41	6	46	9	59	2
20	8	25	4	26	13	32	0	37	0	42	11	48	1	61	0
21	3	26	0	27	10	33	0	38	2	44	1	49	9	62	15
21	13	26	13	28	8	34	0	39	5	45	6	51	1	64	13
22	7	27	10	29	5	35	0	40	7	46	12	52	9	66	12
23	1	28	6	30	3	36	0	41	10	48	1	54	1	68	11
23	12	29	3	31	0	37	0	42	12	49	6	55	10	70	9
24	6	30	0	31	13	38	0	43	15	50	12	57	2	72	8
25	0	30	12	32	11	39	0	45	1	52	1	58	10	74	6
25	10	31	9	33	8	40	0	47	4	53	6	60	2	76	5

Sizes of Printing Paper, subdivided.

	Broadside.	Folio.	4to.	8vo.	16mo.
Pot	$15\frac{1}{2} \times 12\frac{1}{2}$	$12\frac{1}{2} \times 7\frac{3}{4}$	$7\frac{3}{4} \times 6\frac{1}{4}$	$6\frac{1}{4} \times 4$	$4 \times 3\frac{1}{8}$
Foolscap	$17 \times 13\frac{1}{2}$	$13\frac{1}{2} \times 8\frac{1}{2}$	$8\frac{1}{2} \times 6\frac{3}{4}$	$6\frac{3}{4} \times 4\frac{1}{4}$	$4\frac{1}{4} \times 3\frac{3}{8}$
Post	20×16	16×10	10×8	8×5	5×4
Crown	20×15	15×10	$10 \times 7\frac{1}{2}$	$7\frac{1}{2} \times 5$	$5 \times 3\frac{3}{4}$
Demy	$22\frac{1}{2} \times 17\frac{1}{2}$	$17\frac{1}{2} \times 11\frac{1}{4}$	$11\frac{1}{4} \times 8\frac{3}{4}$	$8\frac{3}{4} \times 5\frac{5}{8}$	$5\frac{5}{8} \times 4\frac{3}{8}$
Medium	24×19	19×12	$12 \times 9\frac{1}{2}$	$9\frac{1}{2} \times 6$	$6 \times 4\frac{3}{4}$
Royal	25×20	$20 \times 12\frac{1}{2}$	$12\frac{1}{2} \times 10$	$10 \times 6\frac{1}{4}$	$6\frac{1}{4} \times 5$
Double Pot	$25 \times 15\frac{1}{2}$	$15\frac{1}{2} \times 12\frac{1}{2}$	$12\frac{1}{2} \times 7\frac{3}{4}$	$7\frac{3}{4} \times 6\frac{1}{4}$	$6\frac{1}{4} \times 3\frac{7}{8}$
Double Foolscap	27×17	$17 \times 13\frac{1}{2}$	$13\frac{1}{2} \times 8\frac{1}{2}$	$8\frac{1}{2} \times 6\frac{3}{4}$	$6\frac{3}{4} \times 4\frac{1}{4}$
Super Royal ...	$27\frac{1}{2} \times 20\frac{1}{2}$	$20\frac{1}{2} \times 13\frac{3}{4}$	$13\frac{3}{4} \times 10\frac{1}{4}$	$10\frac{1}{4} \times 6\frac{7}{8}$	$6\frac{7}{8} \times 5\frac{1}{8}$
Double Crown...	30×20	20×15	15×10	$10 \times 7\frac{1}{2}$	$7\frac{1}{2} \times 5$
Imperial	30×22	22×15	15×11	$11 \times 7\frac{1}{2}$	$7\frac{1}{2} \times 5\frac{1}{2}$
Double Post ...	32×20	20×16	16×10	10×8	8×5

Table for Giving-out Paper.

Number of Copies.	Number of impressions on sheet.															
	1		2		4			8			12			16		
	Q.	S.	Q.	S.	Q.	S.	O.	Q.	S.	O.	Q.	S.	O.	Q.	S.	O.
50	2	2	1	1	0	13	2	0	7	6	0	5	10	0	4	14
100	4	4	2	2	1	1	0	0	13	4	0	9	8	0	7	12
150	6	6	3	3	1	14	2	0	19	2	0	13	6	0	10	10
200	8	8	4	4	2	2	0	1	1	0	0	17	4	0	13	8
250	10	10	5	5	2	15	2	1	8	6	0	21	2	0	16	6
300	12	12	6	6	3	3	0	1	14	4	1	1	0	0	19	4
400	16	16	8	8	4	4	0	2	2	0	1	10	8	1	1	0
500	20	20	10	10	5	5	0	2	15	4	1	18	4	1	8	12
750	31	6	15	15	7	20	2	3	22	2	2	15	6	1	23	2
1000	41	16	20	20	10	10	0	5	5	0	3	12	8	2	15	8
1500	62	12	31	6	15	15	0	7	20	4	5	5	0	3	22	4
2000	83	8	41	16	20	20	0	10	10	0	6	23	4	5	5	0
3000	125	0	62	12	31	6	0	15	15	0	10	10	0	7	20	8
4000	166	16	83	8	41	16	0	20	20	0	13	22	8	10	10	0
5000	208	8	104	4	52	2	0	26	1	0	17	9	4	13	1	8

Note.—Q *means quires*, S *sheets, and* O *the overplus copies.* Other numbers may be obtained by multiplying any of the above quantities.

One very simple way of calculating the amount of paper required for any work is to bear in mind that each 500 copies of a sheet takes one ream of paper, and 1,000 of a half sheet one ream too. As explained before, a printer's ream of 516 sheets really allows for spoils and overs for 500 copies of a printed sheet, whether it be octavo or sixteenmo. Other numbers in printing, larger or smaller, are only a matter of arithmetic, for if 500 copies are required of a volume of ten sheets of octavo—160 pages—ten reams would be required. If 250 copies, only five reams, but for 1,000 copies, twenty reams would be requisite, and so on.

To find the equivalent weight of paper in another size.—If the table of equivalent sizes is not handy, or does not include the required size—Multiply the weight of the paper you have by the size (in square inches) of a sheet of the paper whose weight you require to know, and divide by the size (in square inches) of a sheet of the first-named paper.

Example: I have a 24 lb. demy paper: what will be the weight of a ream of the same paper in double crown size?

The size of a sheet of demy is $22\frac{1}{2} \times 17\frac{1}{2}$ inches, and that of a sheet of double crown is 30×20 inches. To ascertain the weight of the ream of double crown, multiply 24 lb. by (30×20) and divide by $(22\frac{1}{2} \times 17\frac{1}{2})$, *i.e.*, 24×600 divided by $393\frac{3}{4}$ equals $36\frac{1}{2}$ lb. *Ans.*

There is a multitude of papers of various kinds for general consumption, made by the three methods already mentioned; a few of them are as follows—their names showing their use in most instances. Writings, drawings, printings, are further classifications of these kinds, and the last includes coated (so-called "art") papers, super-calendered, besides ordinary qualities, either white, creamy, or toned. For other purposes there are browns, sugars, cartridges, railway buff, bank, loan, small hand, enamelled, duplex, and a great assortment of tinted papers in various colours and different weights, suitable for almost any purpose.

SIZES OF LETTER AND NOTE PAPERS.

	Inches.		Inches.
Medium 4to	$10\frac{3}{4} \times 8\frac{3}{8}$	Post 16mo	$4\frac{3}{8} \times 3\frac{5}{8}$
Medium 8vo	$8\frac{3}{8} \times 5\frac{3}{8}$	Copy 4to	$9\frac{5}{8} \times 7\frac{3}{4}$
Demy 4to	$9\frac{3}{8} \times 7\frac{3}{8}$	Copy 8vo	$7\frac{1}{4} \times 4\frac{5}{8}$
Demy 8vo	$7\frac{1}{4} \times 4\frac{3}{4}$	Foolscap 4to	$8 \times 6\frac{3}{8}$
Demy 16mo	$4\frac{5}{8} \times 3\frac{5}{8}$	Albert	$6 \times 3\frac{7}{8}$
Large Post 4to	10×8	Queen	$5\frac{3}{8} \times 3\frac{1}{2}$
Large Post 8vo	8×5	Prince of Wales	$4\frac{1}{2} \times 3$
Post 4to	$9 \times 7\frac{3}{8}$	Foolscap	$12\frac{3}{4} \times 8$
Post 8vo	$7\frac{1}{8} \times 4\frac{1}{2}$		

Cards are also dealt with by a warehouseman. These are made in boards, generally royal size but sometimes in imperial, and cut to standard measurements. The average sizes are here given:

SIZES OF CARDS.

	Inches.
Large	$4\frac{1}{2} \times 3$
Carte de Visite	$4\frac{1}{8} \times 2\frac{1}{2}$
Small	$3\frac{1}{2} \times 2\frac{1}{2}$
Reduced Small	$3\frac{1}{2} \times 2\frac{1}{8}$
Extra Thirds	$3 \times 1\frac{7}{8}$
Thirds	$3 \times 1\frac{1}{2}$
Half Small	$2\frac{1}{2} \times 1\frac{3}{4}$
Town Size	3×2
Half Large	$3 \times 2\frac{1}{4}$
Double Small	$5 \times 3\frac{1}{2}$
Double Large	$6 \times 4\frac{1}{2}$
Quadruple Small	7×5
Quadruple Large	9×6

Cards are of various colours, qualities, and characters. They are of two kinds, *i.e.*, pulp and pasted. The former are obviously made in bulk as paper is, and the latter are

regulated in thickness by the number of sheets pasted to form any one board, and are known as "three sheet," "four sheet," etc., according to the number used. When stocked in the cut sizes these are mostly done up in packs of fifty-two (the odd two being for overs or spoilage). The cards in boards are generally reckoned by the gross, one hundred and forty-four boards. The annexed table is useful for determining the number of cards of a given size to be obtained out of a royal board:

NUMBER OF CARDS CONTAINED IN A ROYAL BOARD.

Thirds	96	Double Small	25
Broad Thirds	80	Double Large	16
Small	50	Quad Small	12
Large	32	Quad Large	8

For packing, wrapping, or other purposes these sizes of brown paper are most commonly in use:

SIZES OF BROWN PAPERS.

	Inches.		Inches.
Casing	46 × 36	Imperial Cap	29 × 22
Double Imperial	44 × 29	Haven Cap	26 × 21
Elephant	34 × 24	Bag Cap	24 × 19½
Double Four Pound	31 × 22	Kent Cap	21 × 18

CHAPTER XXXIII

Machines and other Appliances used in connection with the Warehouse Department—The Hydraulic Press—The Nipping Press—Glazed Boards—Hot Pressing—Hot Rolling—Cold Rolling—Cutting Machines.

IN connection with the warehouse certain mechanical appliances are necessary. Presses for cold pressing—the power for which is generally obtained by hydraulic pressure; rolling machines both for hot and cold methods; and cutting machines for paper.

Owing to the prevailing hard-packing method of printing not so much pressing is now done; as a matter of fact, this volume has not been pressed or rolled after printing. Also, as much printing is done on antique rough papers, it is considered unnecessary to smooth the sheets by pressing, a slight impress of the type being preferred by many.

The *hydraulic press*, fig. 173, is made in various sizes, and the pressure is given by means of water, which is forced by pumping (either by hand or by power) into a receptacle which contains the piston or ram. This ram is attached to the bed of the press, and the act of pumping gradually raises this bed from the bottom. As very great pressure is given, the sides of the press, as likewise its head, must be of great strength, and, as a matter of course, made of iron. When it is pumped up and the required pressure exerted, it is held by fastening a valve, and if the press is in good order the power is retained as

long as required. By unscrewing the valve again and turning on a tap, the water forced up is released, and the pressure thus relaxed. A power of 450 tons may be given

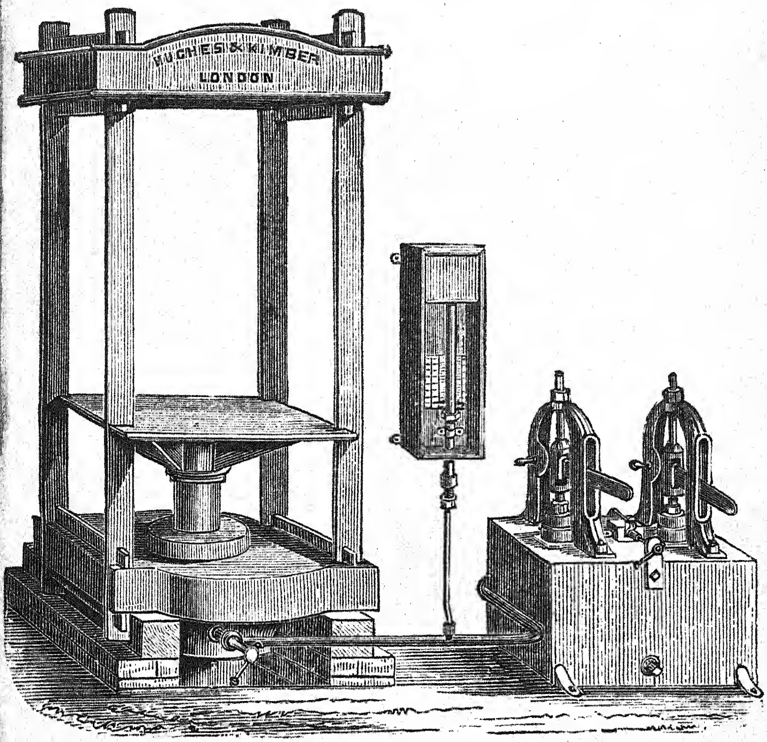


FIG. 173. HYDRAULIC PRESS.

and retained by an ordinary press with a 12-inch ram, which will take, say, double demy. If the leather collar of the piston becomes worn, it will cause a leak and power is thereby lost. A dial indicating the exact pressure exerted

is sometimes attached to these presses, and is a guide in pumping up. The example given is one with double pumps attached, greater power being thus obtained.

A *nipping press*, fig. 174, made of iron, and worked by means of a screw, is a handy adjunct to the warehouse. It is very useful for jobbing work of a small character often required in a great hurry, when a nip will suffice.

Glazed boards are used for pressing purposes. These boards are mostly made of rope and thoroughly well milled

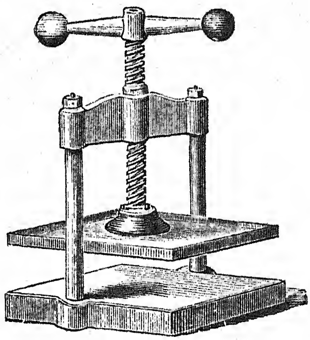


FIG. 174. NIPPING PRESS.

and rolled. The printed sheets are placed between them, the impression being taken out and a slight glaze imparted from contact with the boards in pressing.

SIZES OF GLAZED BOARDS.

	Inches.		Inches.
Foolscap	18 × 14½	Double Foolscap	28 × 18
Demy	23½ × 18½	Super Royal . .	28½ × 21½
Royal	26 × 21	Double Crown .	31 × 21
Royal Extra . .	27 × 22	Imperial . . .	31 × 23

In filling up the press it is customary to place iron plates at certain intervals; this gives additional solidity to the

whole, and, in the case of two or more sizes of work being placed in the press at one operation, compensates for the difference in size of sheet and distributes a more equal pressure all over. Glazed boards soiled with ink may be cleaned with a little turpentine rubbed on with a piece of flannel and finished with a soft duster.

Hot pressing is as a rule undertaken by outside people, and is generally performed by a hydraulic press, hot plates being inserted at frequent intervals. The impression is taken out more easily by this method, and a better finish usually given by the heat employed. The sheets are placed between glazed boards as in cold pressing. This process is well adapted for illustrated work, when printed on ordinary paper, owing to its thoroughness in pressing and finish without an excess of glaze, which is given by hot rolling.

Hot rolling machines are constructed for the purpose of drying and pressing (or rolling), the heat being obtained either by steam or gas, Gill's machine, fig. 175, was the first brought to the notice of the trade, but another has been introduced by Mr. Salmon.

For fine work which is not in a great hurry this process is not recommended, as the heat somewhat deteriorates the colour of the ink: but for average work which is wanted quickly it is admirably adapted, as the machine answers the double purpose of drying and pressing, besides effecting a large economy in the drying room, which may be utilized for other work in less hurry and requiring to be dried by the slower process. The degree of rolling by the hot system may be regulated—the heavier the roll the greater the glaze. Of course, this has the effect of thinning the paper by the great pressure brought to bear on it, but in some instances, in very bulky books, this may be desirable; for example, the bulk of the official "Post Office Directory" is considerably reduced by this method. As before said, this class of rolling is a great labour-saving consideration,

but, naturally, the ink, to retain its normal colour and density, should be dried by more natural means, for it is by the older and more gradual method of drying that really first-class bookwork should be executed, if durability and fullness of colour be desired. The glazing, too, for some

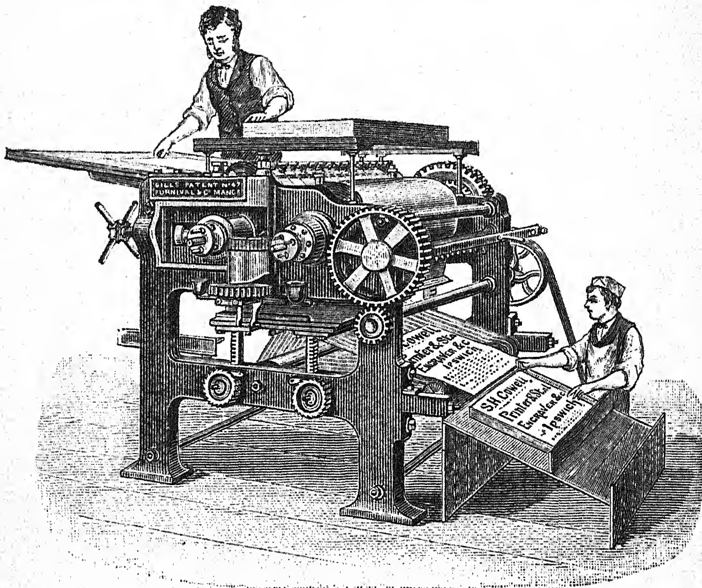


FIG. 175. HOT-ROLLING MACHINE.

characters of paper, is objectionable; the act of rolling, hot or cold, having the tendency to take all the "life" out of the paper, thus entirely altering its original texture. For illustrated magazine work, where time is an important item, and the class of engravings is improved by rolling, it is very useful, and is particularly recommended.

Cold rolling may also be performed by the last-mentioned machines, but for any great quantity the ordinary kind of

rolling machine is advised. Less surface is imparted by this last process, and if cuts have to be printed on a paper with an indifferent surface, cold rolling is resorted to before and after the work is printed. If cuts are to be printed on one

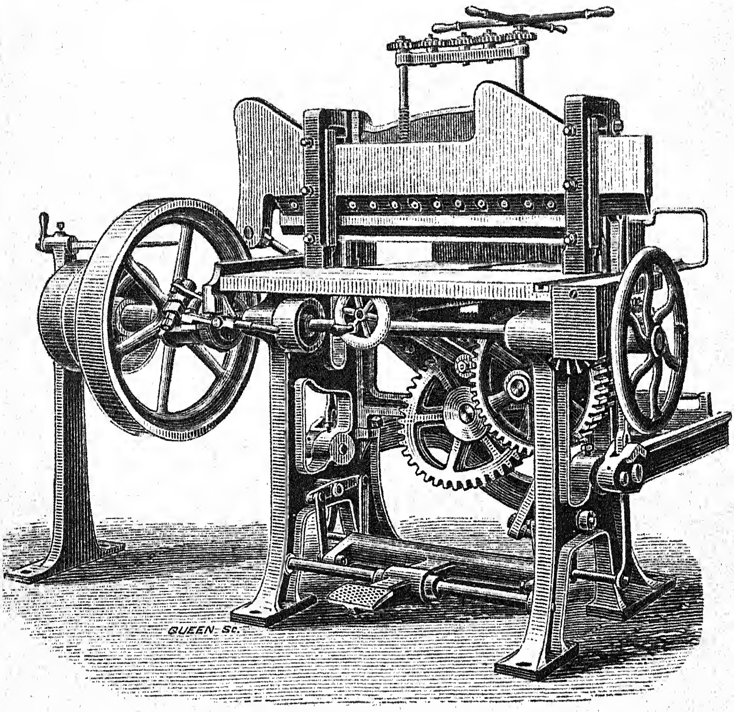


FIG. 176. FURNIVAL'S CUTTING MACHINE.

side only, as for separate plates, the paper need only be rolled on that side. To do this it is customary to send two sheets through the machine at one time, back to back, the outside of the two sheets only being glazed and the inner sides retaining the original surface. This plan prevents the

paper being made too thin. There are two methods of rolling, viz., plate, and that performed simply by running the work between the bare rollers, without anything in the shape of boards, sheets, or plates. In rolling printed work great care should be taken to prevent offset of ink. The hot-rolling apparatus has an automatic arrangement for cleaning the rollers when in use. For cold rolling the best way is to have the printed work thoroughly dried, or it will assuredly be spoiled.

Cutting machines form an important feature in the warehouse department, and the selection of a machine offered by well-known firms is advised. Various machines are be-

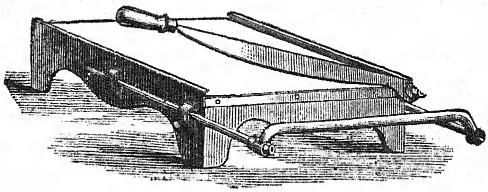


FIG. 177. CARD-CUTTING MACHINE.

fore the trade, but those on the guillotine principle are the best. Some give a straight and direct cut, others a diagonal; there is also a self-clamping arrangement used. Furnival's machine, fig. 176, is one of this class, embodying all the latest improvements, and thus effecting a great saving of time in cutting large quantities.

For the cutting of small jobs a *spring guide* is used, which allows of the work being pushed to the front for the cut—the width of the platen preventing this in the ordinary machine.

A *card-cutting machine*, fig. 177, is likewise useful in this department. For the present, these are all the machines required in the warehouse; the other appliances will be dealt with in order.

CHAPTER XXXIV

The Care of Paper—Wetting down—The Wooden Press—Counting—The Drying Room—Cold Pressing and manner of performing the same—Stacking Work—Gathering—Collating, Folding, and Packing—Keeping Stock—Parcelling—Folding, Stitching, Stabbing, and Sewing—Binding, Ruling, Perforating, and Numbering.

ONE of the first duties of a warehouseman is the charge of white paper—in large offices a separate warehouseman is told off for this purpose. All paper received should be checked and entered up in a proper book, showing at a glance the date, from whom received, the size, weight, and description, besides the name of the work it is intended for, and on whose account it is sent in, whether a customer's or the "house." These latter particulars are important, as a printer often keeps a stock of certain kinds of paper for his own use, or for customers for whom he supplies paper. Nothing should be given out or used till a note has been taken; in doing so it should be seen whether reams are "perfect" or not.

Wetting down.—To prepare paper for printing it was formerly customary to damp it down—that is, ordinary printing paper. Nowadays, with the exception of handmade papers, which are always best printed dampened, or hard antique papers, to which the same remark applies, no wetting is done in the printing office, because so much smooth paper is used. Soft or unsized, glazed or rolled, and writing papers should not be wetted down, as that operation would

spoil them at once; they must be printed dry. In wetting down all other papers, the nature of the paper must be considered; some of the papers, being well sized and consequently somewhat hard, will not take the water easily; when wetted they require to lie by longer, and need more turning. Supposing the paper to be treated is an ordinary printing paper, machine-made, and quired or folded, the

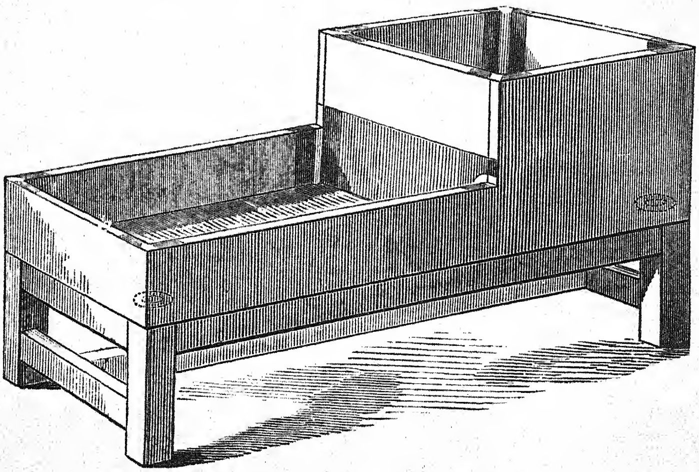


FIG. 178. WETTING TROUGH.

wetter should open his ream, and place it on the left of his *wetting trough*, fig. 178, open the quire, smooth out the back, and dip one end of the sheet in first, drawing it through the water in the form of a curve, fig. 179. When he has done that, he should place it flat on a quire already opened, but not wetted. Having laid the damp quire on the dry, he should lay another dry one on the top of the wetted one, and so on to the end of the ream—each wetted quire being sandwiched between two dry ones. When he has completed the ream or reams required, a board should be placed on

the top, one having been placed at the bottom to receive the first quire, and weights placed on the top for a few hours, in order to press and soak the whole pile thoroughly. When time has been allowed for this, the board should be taken off, and the whole of the ream turned. This is performed simply by turning round (not over) every quire or so, thus mixing up the whole, dry and wet; by turning the paper in the way suggested, the right and wrong sides of the paper are still kept separated, and this is a distinct help in printing off. The paper should then be placed in the screw press, and fastened down. These presses are of wood, and are worked by an iron screw attached to the "follower."

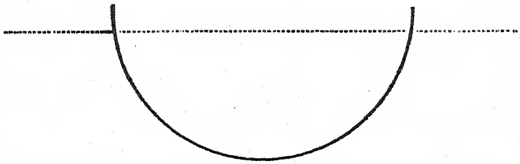


FIG. 179. PASSING PAPER THROUGH THE WATER.

Counting.—Paper should be checked before being given out for printing. As the operation of counting is a very important one, great correctness is necessary, especially with printed work. The method adopted is to take two or three quires, according to the thickness of the paper, at the corner, and give it a sharp turn over by a quick movement of the wrist. If this is done properly, the sheets are fanned out, and may be counted very readily. They are counted off in fives, twenty "fives" to a hundred, and the hundreds usually lapped over. This is the most expeditious manner of counting, an expert being able to run through a thousand in a very short space of time. In giving paper out, reams should be perfect, or made so, and duly entered up. When printed it has to be counted again, and if correct, entered—the date, signature, name of work, and workman being noted.

In sheet work it is advisable to count it when the first side is printed off, before perfecting the sheet—this plan will obviate errors, and possibly avoid disputes.

The drying room is the next consideration, and the most useful one is that heated by hot water; steam is sometimes used. Here again it must be observed that, as few papers are now wetted down, the need for a drying room is not so great as formerly, for all printing in quick-drying inks may be stacked as fast as printed, and if done by the hard-packing process no pressing is requisite. But if a special room is necessary, the pipes should be arranged all round

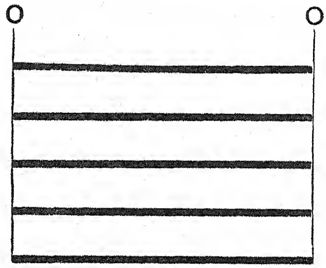


FIG. 180. DRYING POLES.

the room in coils, and, if the room is large, some placed in the middle too. The drying poles are frames, fig. 180, hanging from the ceiling, which slide along two larger horizontal poles. Those which hold the work are about two feet apart, the length being determined by the width of the room. By placing these frames on a sliding arrangement overhead they may be shifted along, and a wider passage formed between each two, so as to allow a person to pass along, in order that he may get at the work readily.

Placing the printed work on the poles is performed by dividing the ream into "lifts" or handfuls, just overlapping each other on one edge. The topmost poles are reached

with a *peel*, fig. 181; several lifts are put on at a time, and placed in their position by the same implement—the lower ones, of course, are best filled by hand. The room should be kept up to a uniform heat—about 120 degrees Fahrenheit—and the work removed as dried, and its place occupied by other work.

In the absence of a proper drying room poles are sometimes suspended singly from the roof of the warehouse, and the work is dried by perfectly natural means; but care should be taken that the top sheets do not get soiled by dust; to prevent this wrappers should be placed over each lift. The peel is here an indispensable tool in hanging up, as also in taking down. When the work is sufficiently dry it should be stacked, each signature by itself, and a separate pile to each work, till it is ready to be pressed or rolled, as the case may be.

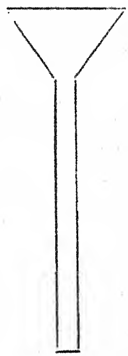


FIG. 181.
PEEL.

Where *cold pressing* is actually necessary it is customary to place the sheets separately between glazed boards, as near the centre of the board as possible, because the edges are likely to be marked in pressing if the sheets are not placed correctly over each other. As far as practicable it is best to have all one size and character of work pressed at one operation, the iron plates being inserted at intervals, as before explained. Assuming it is a hydraulic press, the work should remain in the press all night, and as it is taken out of the boards fresh work should be placed in the empty ones. This is generally done by three persons, as shown in the diagram on the next page, fig. 182. Here are seven piles. Two *fillers-in* stand at the ends at B (to be pressed). One *taker-off* only is required, and he removes the sheets from both sides at C (which have been pressed), and stacks them evenly on D.

Stacking work.—If the work is not ready for delivery or gathering, the signatures should be stacked in a pile, and if likely to stand in that position for any length of time, a few "tops," *i.e.*, a few sheets of each signature comprised in that particular pile, placed on the top. This plan frequently obviates a deal of trouble, because a set or sets of sheets are sometimes asked for by a customer whilst the work is in progress, and the pulling down of the whole of the pile is avoided by this means. Always build stacks on a board or stage raised from the ground, as this prevents accidents from the upsetting of water, or the bottom of the pile being damaged by getting knocked or even kicked by the feet.

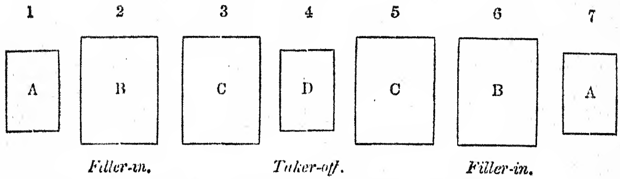


FIG. 182. FILLING IN AND TAKING OFF.

Gathering.—When it is necessary to gather any work a table is used, generally of a horseshoe or three-sided pattern, which should be large enough to hold twenty sheets of, say, double crown at least, placed side by side. Rotary or revolving gathering tables are sometimes used, the bench revolving as the operator stands in a fixed position, and lifts one of each sheet as it passes him. The sheets should be laid down on the board in order of alphabet, commencing with signature B, the title and other oddments coming last. If the book is a long one, or the paper is thick, the gathering must be made in two or even three sections. One of each signature only should be gathered at a time, and

when the end of the table is reached they should be gently knocked up squarely at the edges, and each book or section placed in a pile. Owing to machine folding being used so much, many binders prefer the sheets of a volume packed and delivered in bulk, that is, not gathered, but the various signatures or sheets packed separately.

Collating, folding, and packing.—When a heap is formed it should be collated by means of a bodkin or piece of rubber, all duplicates drawn, and wrong sheets rectified. As each book is collated and found correct, it should be simply moved aside a little in the left hand to indicate the division between them, and when the hand is full, lifted off the pile, and turned face downwards. They are then ready for folding in half. This is done merely for the more convenient packing of parcels. In folding these books or sections care should be exercised to obviate "herring boning," that is, not creasing the paper by the improper use of the folder. This can be obviated by holding the folder somewhat flatly, both in the up and down strokes with that instrument, reversing the angle of the folder on the back or down fold. When folded, the work may be booked; if in sections, the parts must be put together, and reversed—every copy—in order to keep the parcel flat and square. If the book is in one section only, the copies may be reversed, or turned in "sixes." Suitable parcels as regards size should be packed in brown paper, tied with string, and labelled with the name of the work and the number of copies they contain. If the balance of the work is to go into stock and not delivered as a complete edition at once to the binder, these copies, if not gathered, should be so booked up that each separate parcel contains perfect or complete copies of the volume.

To return to the finishing off of the sheets after drying. The methods of hot pressing, hot or cold rolling, have been already mentioned. Cold pressing is nearly always done by the printer himself, but the other methods, especially

the hot pressing, by outside firms. To repeat, the great point in this method is that the rolls should not be too hot, and that too great a pressure should not be exerted. If the former happens the ink will suffer, and in the latter case the paper will be thinned out too much; for ordinary purposes the impression is all that is necessary to be taken out, and in doing this sufficient glaze and finish will be given to the sheets. Offset is another danger to be avoided by the proper use and care of the special apparatus for the purpose, a solution of common soda in water being mostly used.

Keeping stock.—In delivering work it is most essential that a complete record should be kept, and nothing sent away without a signature being given for it. The warehouseman should keep two ledgers, one for white paper, accounting for all paper received and used, and showing at a glance what is on hand. It is best that the stocks of customers be kept distinct from each other, and, if complicated, that one separate entry be made for each kind of paper. Further, it is advisable that the house papers—those supplied for the different jobs and works by the printer himself—be kept quite apart from any customer's; in fact, treated, as it were, for quite a distinct customer. If these suggestions are carried out, and the books kept up to date, much trouble and labour will be saved in referring from time to time, and a report or stock-list may be furnished at short notice. All white papers should be kept covered up, and broken reams—we mean parts of reams—re-packed and marked as to quantity. Printed work should also be protected, and if stacked for any length of time whilst the book is in progress, the pile should be built squarely and firmly, and care taken that the edges are all even and well knocked up. Stacks should be well covered at the top to keep them free from dust and dirt, and, certainly, printed sheets or reams should not be handled or carried about without a top or bottom sheet; a wrapper on both sides is the best protection.

On the first delivery of any job or work a complete copy should be laid aside for charging-up purposes by the counting-house, but this copy need not be a good one so long as it is perfect as regards the whole quantity, and has a ticket attached explaining the name of customer, date of delivery, size, quantity printed, if paper supplied by customer or house, and all other particulars.

In *parcelling* up works for delivery, neatness in packing and conciseness in labelling are two great points. The parcels should not be unwieldy, but adapted for handling easily. Care should be taken that the string does not cut into the edges of the sheets, which may be obviated by a piece of paper doubled up and placed under the string at the points where it turns over the edges of the parcel. If it is a very particular character of paper, it is best either to seal it up with parcel-wax, or tie it up with tape such as stationers use for papers sent in flat, because this reduces the risk of damaged edges; but it is of course awkward if necessary to draw on the parcel, as it requires re-sealing up, whereas a bundle tied up is more readily re-tied.

Folding, *stitching*, *stabbing*, and *sewing* come under the head of binding, and are sometimes done in the house, so a description of these points may be of interest. Stitching applies mostly to pamphlet work of a single section, when it is stitched through the centre of the sheet at the fold by opening it, and sometimes through the wrapper, if there is one, at the same operation; sometimes the wrapper is drawn on, that is, glued or pasted on, after stitching. Stabbing is a system to be avoided as much as possible, because it is a method which does not allow of the book opening freely; it is adopted frequently for pamphlets of several sections, and is performed by stabbing the thread through several sheets at the side, as shown on the next page, fig. 183.

Sewing is used for books, and is the best way of binding anything together consisting of more than one section.

Each sheet is sewn through the middle of the fold, over two or three cross tapes or strings, according to the size of the book, and the thread carried into the next sheet, and so on; this is the proper method, allowing of the book opening easily. Wire is also to be avoided as far as possible, especially with volumes—thread does not cost much more, and is certainly more satisfactory in the long run.

Edges of books are treated differently, sometimes according to fancy. "Untouched" or "unopened" edges are those which are left precisely as folded; "trimmed" edges, the

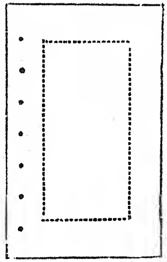


FIG. 183. STABBING THE SHEETS.

heads and bolts are left unopened, and the fore-edge and tail lightly trimmed to make tidy only, but not necessarily smooth; "cut edges" are when a book is cut all round perfectly smooth. "Uncut edges" are not necessarily books that have not been cut, but mean that the edges have not been cut round flush by machine, although the bolts and heads may have been opened by hand.

Publisher's binding is defined as cloth-work or case-work, but binding proper is really applied to those books bound in leather. Whole bound is when a book is encased in leather entirely; half-bound, when the back and corners are in leather and the sides in paper or cloth; quarter-bound,

when the back only is leather, the sides being cloth or paper, as in half-bound.

All these matters sometimes come under the supervision of the warehouseman in giving out work for binding, and it is necessary that he should have some knowledge of the different styles.

Ruling, perforating, and *numbering,* used for a variety of purposes, are often done by the printer, but sometimes executed by outside firms, and the terms used will explain themselves to the student.

CHAPTER XXXV

On Cost of Production and Selling

VERY much has been written and said during the last few years respecting the various systems of keeping costs and the selling prices made by different printers. That something is radically wrong in the prevailing methods is apparent to all thinking printers when the glaring differences in estimates made out for public work put out for contract are compared. Most of the suggestions made for a levelling up are wide of the mark, we feel sure, and if the printer or printers have a proper system of bookkeeping in use there should be no difficulty in formulating such a basis as would ensure a proper return for all outlay, interest on capital, and a reasonable profit on the work produced from any establishment. The want of such a system is a weak point in many firms, but it is a matter entirely of account, and the remedy is not a difficult one if the printer will only keep a true record of every item coming in or going out of his establishment, and unless this is strictly done it is hopeless to expect that any one can see the exact position of affairs. It requires not only a precise knowledge of figures, but a keen discrimination between the debt and credit side of a ledger. The great weakness is that of insufficient knowledge of the general expenses current in a printing office, and a failure to differentiate between cost of production, expenses, interest, and profit. The first is

made up of actual wages paid in the productive departments, and materials used, but the second item is really the great stumbling block, for it includes many items which are lost sight of if the utmost care or vigilance is not exercised. Details coming under that head include, among other sundries, management, rent, rates and taxes, lighting, power, bad debts, depreciation of plant, consumable materials, as the principal items, and the third is a simple one of interest to be calculated on amount of capital expended. Supposing the books are very carefully kept, it should be a very easy matter to grasp the situation by grouping and dividing the complete figures for say one year. By taking the total wages on all work done and all materials either purchased or taken from stock, we arrive at the dead cost of the article. As before said, the selling price should be governed by the working expenses of the establishment, it should also include interest on capital, and something in addition for profit on labour and outlay. The precise amount can only be determined by reference to the books, and if one year's business is taken as a basis, it should be checked by the subsequent annual figures. In London some large firms find that the relative cost of wages in the composing and machine departments totals to almost an equal amount with all the other working expenses of the establishment, including the needful margin of profit. This is only a rough and ready assertion, but nevertheless it may be taken as an average, and shows how necessary it is that a very close oversight be exercised all round. For instance, by having a good and sufficient plant, with competent employees, much more will be produced, and then, by exercising the most careful management, the expenses can be kept down to a reasonable amount. There are many small things in a printing office which may be, if care is not taken, described as leakages, and it should be the business of the heads of departments, subject to the general management, to keep a

sharp eye on all materials used, which may be considered as part of the item for general expenses. A penny once saved will be a pound later on; this is a truism which applies very forcibly to all printing offices.

We have here only been able to indicate on broad lines the principles which should determine the actual selling price, but the precise treatment of detail is a matter to be arrived at by the printer himself, because this is regulated in a very large measure by the local surroundings and conditions under which he works. Therefore let him see for himself exactly what his outlay is for wages, and for materials bought or supplied from stock for work done, then find the precise proportion of expenses which consists of the heads already mentioned. These two main items will then give the actual cost of a job or work, and it will remain for him to put such a profit on the whole as will cover all unforeseen contingencies and give him a reasonable profit on his labour and outlay.

We repeat that there are various ways of dealing with this important matter, and they will suggest themselves to the printer as he progresses in his business and observes the periodical results of his trading, but it is imperative, as before said, that he have a thorough grasp of the details underlying the principles of cost and selling in order to ensure a reasonable return for his labour and capital. To lay down here any definite rules in detail is not possible, the printer must work out for himself the actual lines on which he should formulate his basis, having a regard to all that has been expressed in this chapter.

Some interesting literature on this subject is issued by the Master Printers' and Allied Trades' Association (London), and "Profit for Printers" may be read with advantage. Other works will shortly be published as a result of the Costing Congress now sitting.

EXAMINATION PAPERS

QUESTIONS IN TYPOGRAPHY, 1910-12

THE following QUESTIONS were set for the Written Examinations of the CITY AND GUILDS OF LONDON INSTITUTE for the three years 1910 to 1912 inclusive.

SYLLABUS FOR 1912-13.

GRADE I (PRELIMINARY).

WITH the view to encouraging Apprentices to take a continuous Course of Instruction in this Subject, the Examinations will be held in three Grades, of which Grade I will be of an elementary character. No Certificates will be given on the results of the Examination in Grade I, but the list of the names of the Candidates who pass will be sent to the Centre at which they were examined. Candidates may enter for the Examination in Grade II without having passed in Grade I, but Candidates for the Final Examination will be required to have previously passed in Grade II.

The Examination in Grade I will consist of a Paper of Questions only in two Sections, (1) for Compositors, and (2) for Press and Machine Candidates, but Candidates for either section will be expected to show some knowledge of Elementary Geometry and Freehand Drawing. The Examination will include such subjects as the following:

1. *Composing.*—Spelling; punctuation; appliances and materials used in case room; technical terms generally; composition of type-metal; qualities of good type; description of the parts of a type; weight of type and leads; relationship of type bodies and their proportion to foot; lays of the case; characters in a fount; casing letter; attitude at frame; rules to remember when setting; habits to acquire and avoid; rules for spacing and justifying; rules for dividing words; rules for distributing; locking-up and unlocking; casting up matter; readers' marks; signatures and their use; definition of stereo, electro, woodcut, and process blocks.

2. *Press and Machine Work.*—Sizes and sub-divisions of papers and cards; number of sheets in quires and reams; use of signatures;

chases and furniture; locking-up and unlocking formes; simple schemes of imposition; definitions of stereotype, electrotype, woodcut, process block, three-colour process; other technical trade terms and phrases; descriptions of hand-presses, platen and single cylinder machines; how to cover a tympan, cut out a frisket, prepare a platen for making-ready, and dress a cylinder; the constituent parts and working condition of rollers; the care of inks; washing of formes; cleansing of wood, electro, and process blocks; mounting plates.

Grade II (Ordinary Grade).

The Examination in Grade II will consist of a Paper of Questions, and of a Practical Examination for Compositors to be held in a Printing Office. Candidates who enter under Section I must pass in both parts of the Examination to obtain a Certificate.

Written Examination.—The Examination will be divided into two parts, (1) for Compositors, and (2) for Pressmen or Machine Minders. Candidates, according to their occupation, may select their questions from Section I or from Section II.

The questions will be founded on such subjects as the following:

I. *Composing.*—All the matter contained in the Syllabus for Grade I; production of bookwork; casting off MS.; preliminary matter—how to set; notes—how to set; making-up—various operations; proportions of type to page; measures for bookwork; making margin; imposition; sheet and half-sheet work; signatures; various problems in type bodies; point system; display in its various phases; use of ornament in display; use of borders and vignettes, etc.; classification of job-work; harmony of colour; composition of colour work; tint blocks; sketching (rough); table work—how to set; paper—machine and handmade, various sub-divisions, qualities and weights, equivalent weights.

II. *Press and Machine Work.*—Paper—machine and handmade; qualities of paper; super-calendered and enamelled paper; uses of wet and dry paper; damping of paper and preparing it for working; folding, stitching, stabbing, and sewing; counting, packing, and keeping stock; sizes of jobs; schemes of imposition; methods of drying printed work; hot and cold pressing; hot and cold rolling; embossing; quoins and their application; the principal working parts of the various hand-presses, platen, cylinder, and perfecting machines; making-ready jobs and bookwork on same; making register; use of points; the composition and casting of rollers; ink—medium and quick drying; coloured ink; suitable ink for certain papers; underlaying and overlaying; hard-packing system in making-ready—when best employed; preparing overlays for woodcuts and process blocks; imposing stereotype plates for press or machine; varieties of mounting blocks and methods of mounting in use; printing with bronze and leaf metal; causes of slurring on press or machine; electrotyping; stereotyping; composition of ink; harmony of colour; rules for the selection of two, three, and

four-colour combinations; mixing colours; three-colour printing; process blocks, their manufacture and preservation.

Practical Examination. (For Compositors.)—The Practical Examination will consist mainly of composition from manuscript or printed copy supplied to the Candidate. It is intended to be a test, not so much of mere rapidity in "picking-up," as of general intelligence and of ability in setting any kind of matter that may fall in a Compositor's way, clean setting and good spacing being important; for instance, a piece of bad manuscript, a simply displayed title-page or job, a difficult piece of punctuation, a moderately complex table, classical phrases or proper names, or a foreign paragraph in fairly good handwriting. The Practical Test will take place at different centres throughout the country, at which the necessary arrangements can be made. The Examination will be conducted, as far as possible, under the superintendence of expert assistants, who will be required to report to the Chief Examiners as to the manner in which the Candidates have set about the several exercises given to them.

Final Examination (Honours Grade).

Candidates for the Final Examination must hold a Certificate in Grade II.

The questions will not be limited to any particular Syllabus, but will be based upon the groundwork of the Syllabuses for the previous Grades, with a wide range of the whole subject of Letterpress Printing, and will include such subjects as the following:

Construction and management of the hand-press and of platen, cylinder, perfecting, and rotary machines; making-ready; rollers—their manufacture and treatment; the processes of stereotyping and electrotyping; process blocks—line and half-tone: their production and suitability for various classes of work; inks—black and coloured: treatment of; three-colour work; composing and distributing machines; power—steam, gas, and electric; shafting and gearing; the principles of estimating; charging up work; the various essentials required for the production of a perfectly printed book; bookkeeping for printers; general management; the warehouse; cost generally of plant, material, paper, etc.

Full Technological Certificate.

For the Full Technological Certificate, the Candidate will be required to qualify as stated in Rules 29 (*a*) or (*b*) and 30.

29. To obtain a Full Technological Certificate in the majority of the above-mentioned technological subjects, the Candidate will be required to pass the Institute's Final Examination in Technology, and also, in general, (*a*) the Lower Examinations in two of the Science subjects included in the "Regulations for Technical Schools, etc." of the Board of Education, the subjects to be chosen r om those most closely allied to the subjects of the Candidate's

Technical Instruction (in the case of those subjects in which the Board of Education formerly held Practical Examinations the Department will also require evidence that the Candidate has made satisfactory attendance at a Practical Course) or (*b*) the Lower Examination in one of such Science Subjects, and in addition, to give evidence that he has attended a course of instruction in Freehand or Geometrical Drawing during one School year and has passed a satisfactory examination at the end of the course.

30. The Institute will accept as alternative evidence of a candidate's knowledge of the necessary Science subjects:

(1.) A Certificate stating that the Candidate has passed an examination in the qualifying branches of Science at one of the Universities of the United Kingdom or its Colonies.

(2.) Certificates from the Professors of any University of the United Kingdom or its Colonies, or of any University College participating in the Parliamentary grant, or from the Recognized Teachers of the University of London, stating that the candidate has attended approved courses of instruction under the Professors or Recognized Teachers in the Science or Art subjects allied to the technological subject in which the Full Certificate is claimed, and has passed a satisfactory Examination in such Science subjects.

(3.) A Certificate from the Scotch Education Department to the effect that the Candidate has attended approved courses of instruction in the qualifying subjects, and has passed a satisfactory examination in such subjects.

QUESTIONS, 1910-12

GRADE I (PRELIMINARY)

1910

SECTION I.—COMPOSING.

1. What is the space most usually inserted between words when composing solid matter? If the matter is to be double-leaded, would you use the same spacing as for solid?
2. Describe the operation of justifying or spacing out a line of type.
3. Mention the advantages that accrue from careful and accurate distribution.
4. How many lines respectively of 6, 8, 9, 10 and 11-point type are there in a foot?
5. Show what marks a reader would make on a proof to indicate (*a*) that some words had been left out, (*b*) that some words had been doubled, (*c*) that a new paragraph was to be commenced, and (*d*) a one-em rule was to be inserted.
6. Describe the operation of locking up a forme, and state what implements you would use.
7. Describe fully how you would set an account-book heading so as to print accurately in the ruling.
8. What is the difference between a woodcut and a "line" engraving, and for what class of illustration is each best suited?

SECTION II.—PRESS AND MACHINE.

1. Describe the method of obtaining the pitch on a Wharfedale machine.
2. State what you know of the care of rollers.
3. Mention some of the causes of slurring on a platen machine of the "Cropper" type, and state how you would overcome them.
4. What are the dimensions in inches of each of the following papers: Account-book demy, printing royal, writing foolscap, and printing double demy?
5. Describe the push-bar of an ordinary Wharfedale, and state its uses.
6. How would you proceed to dress a cylinder for a 4-page royal 4to circular?
7. How would you prepare a frisket for working off a job at press? Explain what purpose is served by using a frisket.
8. If the rollers were set to roll too heavily or too lightly on the forme, what effect would it have on the work?

1911

Section I.—Composing.

1. What do you understand by even spacing? Give instances in which you would put more or less space, as the case may be, in order that the line should appear equally spaced when printed.
2. What rule would you follow in compounding words?
3. What do you consider a good style to adopt for the use of numerals, figures, or words?
4. Give some special points to be attended to in both distribution and composition to ensure a clean proof.
5. If you were asked to give the composition value of a sheet of bookwork, how would you proceed to do it?
6. Describe the "Wickersham" quoin, and explain its advantages over the wooden sidestick and quoin.
7. Give the sizes in inches of the following: Demy, double crown, quad royal, 3rds card, small card, large octavo court card.
8. Name some useful modern type faces suitable for display work.

Section II.—Press and Machine.

1. Describe fully the working parts of the Albion press.
2. What would be an effective means of stopping a crease on a Wharfedale machine?
3. How would you proceed to cover a press tympan and with what material? Describe also the cutting out of a frisket.
4. Describe the taking-off apparatus of an ordinary Wharfedale.
5. How would you guard against offset during a short run from a half-sheet forme?
6. How would you decide whether an ink had been (*a*) well ground, (*b*) insufficiently ground?
7. Describe the operation of making ready a quarto circular in colour on a platen machine.
8. Describe the American flexible ductor knife of a Wharfedale machine.

1912

Section I.—Composing.

1. Re-write and punctuate the following, correcting all mistakes in spelling: "It was a pleasent apartment as I have said before square sunny and well furnished impresing one as one entered with a genarel air of welcome and homelikedness. On the floar was a cremson carpet on the walls sevarel pictures at the windows cheerful curtins of white tastefuly ornamented with ferns and autum leaves in one corner an old melodean and in the center of the room a table draped with a white clothe."
2. How many lines to the foot are there of the following types: 12 point (or pica), 11 point (or small pica), 10 point (or long primer), 8 point (or brevier), 6 point (or nonpareil)?

3. Give the number of 4-to-pica leads to the pound in each of the following sizes: 15 ems, 18 ems, 21 ems, 25 ems.

4. If you had to show the cast up of a job set in 11 point solid, how would you proceed?

5. State what you know of the composition of type metal, and how you would distinguish between good and bad type.

6. Describe fully the process of making and mounting a stereo from a display type forme.

7. Give the sizes in inches of the following papers: Royal and double demy printings, large post and double foolscap writings, large and double small cards.

8. Name the important points to be observed in composing an article or story from manuscript copy in order to ensure a clean proof.

Section II.—Press and Machine.

1. Describe an ordinary lever galley press, and explain how the pressure is obtained.

2. How would you prepare a platen for making ready a quarto circular with a plain rule border outside and a small half-tone block in the centre?

3. What do you understand by the terms "stiff," "tacky," and "thin," as applied to printing inks?

4. How would you deal with ink which you found to be too "tacky" for any work you had to produce?

5. Name the chief working parts of any single-cylinder machine with which you are familiar. If able to do so, give rough sketch of same.

6. How would you proceed to dress the cylinder of such a machine?

7. What is the difference between a line block, a stereo, and an electro?

8. Draw an imposition scheme for 16 pages crown 8vo to be locked up in one chase, and show the position of "heads," "backs," and "gutters."

GRADE II (ORDINARY)

1910

Section I.—Composing.

1. A pamphlet, consisting of 128 pages in solid 10 point, 20 ems pica wide, and containing 40 lines in a page, has to be re-set in 11 point type (same series), with 3 point leads, size of page to remain the same. How many pages extra will this make?

2. Give the cast-up of the above in 11 point at $8\frac{1}{2}d.$ per thousand.

3. What are the meanings of the following: Shoulder notes, side-notes, foot-notes, runners, errata?

4. Mention some of the principal objects to be borne in mind when setting table-work.

5. What steps should be taken in imposing in order that pages should register correctly and the sheet fold up evenly without "throwing out" when printed?

6. Give the number of ens comprised within the square inch of 6, 8, 10, 11, 14 and 18 point.

7. How would you discriminate between a writing paper and a printing paper? Apart from the quality of material, in what respect does the finish of those papers differ?

8. Name some of the good points you would look for in selecting a new fount of type.

Section II.—Press and Machine.

1. Cut a three-sheet overlay for a half-tone (the necessary pulls are provided).

2. Would you select a coarse or fine bronze powder for use on a rough cover paper? Give your reasons.

3. What would you consider a fair time to allow for making ready and printing 5,000 copies of a sheet of 16 pages demy 8vo bookwork in one forme?

4. How much ink would you use for the above job if (*a*) printed on super-calendered paper, (*b*) antique wove printing paper?

5. What means would you take to ensure double-tone ink developing properly? Are such inks permanent?

6. What is the difference between sheet work and half-sheet work? State which you prefer for long runs and give reasons for your preference.

7. Which is the better class of machine for obtaining perfect register, stop cylinder or two-revolution?

8. What sizes of printing papers are these: 20 by 30 in., 17 by 27 in., 20 by 25 in., 30 by 40 in., 35 by 45 in.?

1911

Section I.—Composing.

1 What width and depth would you make the pages of a demy 8vo book, if set in 11 point solid?

2. How many pages would 20,000 ordinary English words make in 11 point, if set to the size page you suggest for demy 8vo?

3. Of what would the preliminary matter consist, and what types should be used?

4. If the above book was to be issued as a cheap edition, what would be the best way to impose the formes, having in view economy in folding and stitching?

5. State fully the advantages of the point system to the display compositor.

6. What is your idea of good taste in setting display work?

7. State what you consider to be the best principles on which to proceed with regard to setting (*a*) an auction poster, and (*b*) a catalogue cover.
8. What disadvantage is there in making a half-tone block from a proof of a block instead of from the original photograph?
9. Define the difference between stereo, nickel-faced stereo, and electro, and describe how they are made.

Section II.—Press and Machine.

1. Cut a three-sheet overlay for a half-tone (the necessary pulls are provided).
2. How would you prepare the cylinder for printing a high-class magazine containing half-tones?
3. What difference would you make in the make-ready for (*a*) a run of 2 000 impressions, and (*b*) a run of 60,000 impressions?
4. Describe fully a taking-off apparatus which delivers the sheet printed side up, and state the advantages.
5. In printing bookwork, name some of the important points that should be aimed at.
6. In working coloured inks, what precautions must be taken to preserve their brilliancy and economical working?
7. Describe fully the inking arrangements of a cylinder machine of modern construction built for high-class work.
8. How many "perfect" reams of double demy would be required to print 80,000 demy 12mo 2-page leaflets?

1912

Section I.—Composing.

1. Give the number of ens in a square inch of 6, 7, 8, 10, 11 and 14 point.
2. What do you understand by the terms "standard line" and "unit set" as applied to types cast on the point system? State the advantages of "standard line" type for display work.
3. Draw an imposition scheme for 32 pp. of crown 8vo bookwork to be printed in one forme, but to fold as two sheets of 16 pp. for insetting.
4. Describe the process of making an electro from a forme of type, including locking-up and preparing for foundry.
5. A volume consisting of 300 pp. set in 11 point solid, 20 ems pica wide, and containing 37 lines of text in a page, has to be re-set to come into 256 pp. of the same width and depth. What type would you use? (*Show working.*)
6. Give the cast-up value of above 256 pp., at $8\frac{1}{2}d.$ per 1,000 ens.
7. State fully what, in your opinion, are the advantages of the point system for display work.

8. What are the equivalent weights of demy 20 lb., 480 sheets to the ream, in royal 516 sheets; and double crown 30 lb., 516 sheets to the ream, in double demy 480 sheets?

Section II.—Press and Machine.

1. How would you proceed to cut a three-sheet overlay for a half-tone illustration to be used on a cylinder machine?
2. How would you affix above overlay to the cylinder in order to ensure the best result for a run of 20,000 on art paper?
3. What type of cylinder machine would you prefer for a high-class three-colour process job? State reasons for your preference.
4. If mechanical quoins were available for locking up a three-colour job, would you use them in preference to wooden ones? If so, state why, and which quoin you would select, with rough sketch of same.
5. How would you distinguish between an art paper and an imitation art?
6. In long runs from half-tone blocks, the edges sometimes show signs of wear, while the inside work remains either entirely or very little injured. State the cause, and say what precautions you would take, before commencing to print, to prevent same.
7. What would you consider a fair time for making ready and printing 10,000 copies of 16 pp. crown 4to catalogue work, 8 pp. being type only, and 8 pp. full size half-tone blocks with a line of type at top and bottom?
8. What names are given to printing papers of the following dimensions: $17\frac{1}{2} \times 22\frac{1}{2}$ in., 20×30 in., 27×34 in., 35×45 in., 40×50 in.?

FINAL EXAMINATION (HONOURS GRADE)

1910

1. Make out an estimate for producing 1,000 copies of a royal 8vo report, consisting of 48 pages, set 25 by 45 in 11 point o.s., and printed black; 16 pages half-tone illustrations, printed photo brown on art paper, one side only, with wrapper printed one colour and bronze, stitched 3-hole silk cord, trimmed flush.
2. What would be suitable papers for above? How much would be required, including overs, and what would be a fair market value per lb. for such papers?
3. How would you decide whether the art paper for above had a sulphite or grass centre? What advantage is there in having a grass centre for art papers?
4. Define the difference between sewing and stitching as employed for pamphlets and magazines. How would it affect the imposition?

5. Sometimes printing rollers are too tacky or too hard. What kind of weather induces these conditions, and what would you suggest to put them into working condition?

6. Describe fully how you would proceed in the production of a three-colour print from trichromatic half-tones, from getting register to accurately matching the colours of the original.

7. If you had to print a long run from three-colour blocks, which do you consider the best means of duplicating, electro or nickel stereo? Give your reasons.

8. State some of the most fruitful sources of waste in the printing office: (*a*) in the composing room, (*b*) in the machine room, (*c*) in the warehouse.

1911

1. Name the qualifications necessary for a good reader, and mention some of the points in reading in order to preserve style and uniformity.

2. A pamphlet consisting of 64 pages, set in 12 point type, is required to be reprinted as a 32-page pamphlet. What type should be used, the size of each page in each case being the same?

3. Write out a list of ems to the square inch of all the type bodies from 6 to 18-point.

4. Two lines of Cheltenham bold have to be printed in white and embossed on a dark cover paper. Describe fully how you would proceed, and what you would use to obtain the embossed effect.

5. Describe fully the platen machine you consider most suitable for the production of three-colour work.

6. The coating of art paper will often "lift" whilst printing, especially in cold weather; give the reason for this and the remedy.

7. What size boards would you order for 50,000 "official size" postcards, and how many gross would you require?

8. What horse-power would you require to drive (1) a quad-demy Miehle; (2) a quad-demy Wharfedale; (3) a quad-demy Perfector; (4) a 40-in. self-clamp cutting machine?

9. State what you know of gas-producing plants, and in what way they effect economy.

1912

1. Draw a scheme of imposition for 32 pages, the sheet to be folded on a folding machine, or, if folded by hand, no turn of the sheet to be necessary.

2. Give in detail the items of cost which have to be reckoned with in fixing the charge for monotype setting.

3. What do you consider the best means of preventing off-set on a perfecting machine?

4. Describe how you would proceed to make ready a two-colour job, the key forme of which must be the last working.

5. In what way are rollers affected by chrome inks, and ink containing a large percentage of varnish?

6. What are two-tone inks? Describe the difficulties and dangers arising from their use.

7. What books and vouchers would you adopt for keeping accurate record of incoming and outgoing white paper stock?

8. Describe the processes of pressing and rolling printed work.

9. What form of belt fastener do you consider the most satisfactory, having regard to ease of fixing and security of hold?

10. Name some of the advantages and disadvantages of tube and electric ignition of gas engines.

QUESTIONS IN KNOWLEDGE OF PRINTING, 1907 TO 1912

THESE Questions were set for the Written Examinations in the 1907, 1909, and 1912 Competitions for situations for Clerks in H.M. STATIONERY OFFICE on the last three occasions.

NOTE. The regulations which are subject to alterations for future examinations define the limits of age as between 21 and 25. Candidates will be required to show what technical education and practical training they have undergone to qualify themselves for a situation of this nature, and they must satisfy the authorities that they possess the special qualifications necessary for the situation. They must also show that they have served the usual apprenticeship for a period of at least five years to the printing trade or as "compositor," and must have been recently and for a sufficient time in actual employment. Further information can be obtained from the official Report, price 6*d.*, to be obtained through any bookseller. These questions are now printed by the kind permission of the Controller of H.M. Stationery Office.

1907

EXECUTIVE.

1. What is the average rate in distributing type as compared with that of composing ordinary matter from fair copy?

2. In what respect is the action of a platen machine similar to that of a hand press? What is the average number of copies produced in an hour from the one and the other?

3. What kind of "originals" are most suitable for reproduction by (*a*) line, and (*b*) half-tone processes? In printing, what papers are best adapted for these two methods, in order to give full effect to the illustration? State the reasons for your conclusions.

4. What are the advantages of machine composition as compared with that set by hand? Why should not machine work be employed for pamphlets, reports, and similar work?

5. Write out a list of all the type bodies, placing them in their correct order, commencing with the smallest size. Describe these bodies by the old names (pica, etc.), and add at the side the nearest equivalent in points to each one.

6. Enumerate some of the good points to be sought for in examining the presswork of any job or work. Specify a few of the faults to be guarded against in printing.

7. Describe shortly the precise differences between a zinco and an electro or stereo block as used for printing with type. Which block is capable of giving the largest number of impressions?

8. Give the different sizes in inches of the following cards: double large, small, ordinary thirds, and town.

9. What is the object of the geared inking and roller attachment to a Wharfedale? Say how it is arranged on the machine in order to be efficient in its working.

10. Referring to tricolour printing, give the three primary colours used and state the secondaries obtained by the overlapping of these primaries. What are tertiary colours?

Estimating.

1. Supposing that you had an order to print 30,000 copies of an 8 pp. demy 8vo pamphlet, what would you suggest to save wear and tear of type and to economize in working off at machine? How much, and what size of, paper would you require; what weight would you buy, and what price would you pay for such paper?

2. A customer wants a quotation for printing 1,500 copies of a pamphlet of 9,600 words, to make, say, 32 pp. crown 8vo in all. What size of type and lead would you suggest in order to get it into that quantity? Make out an estimate in detail including paper of an average weight and price for such a job, and including folding and stitching, but not a cover. Show cost prices, with expenses and profit added.

3. Detail some of the many items which come under the head of expenses in the various departments of a printing office, as distinct from the cost of labour or stock specially bought in for any particular work in hand.

4. How would you proceed to cast off a volume of 320 pages printed in pica (12 point) set solid, and to be reprinted in long primer (10 point) with one thick lead (3 point)? Give the working.

5. Make out a complete table of sizes of printing papers from quad demy down to single demy, giving their measurements in inches, and add from memory, as far as possible, the equivalent weights in each size, assuming that single demy weighs 32 lb. to the ream of 516 sheets.

6. Find the approximate weight of type (including a definitely expressed percentage to cover sorts, etc.) that should be ordered from the typefounder in order to get up a volume of 300 pages set solid in long primer type, 21 × 36 ems of pica appearing.

7. Make out the labour cost of composing a volume of 256 pp. in pica type, demy 8vo size, set 23 picas wide with a 6-to-pica lead and measuring 44 picas long, including head and white lines. Give also the *extra* cost of setting 32 pp. of long primer footnotes, and the *extra* cost of 16 pp. bourgeois index matter set in two columns—the whole consisting of 256 pp.—the extras arising from the difference between text type and the smaller founts.

8. Draw a scheme of imposition showing how a forme of 32 pp. should be laid down consisting of various oddments: 16 pp., 8 pp. and two of 4 pp. each, so that the sheets will cut up and fold properly when they are dealt with by the binder.

9. What number and weight of leads would be required for 16 pp. of royal 8vo, 25 ems of pica wide, set in English type with a 4-to-pica lead, measuring 48 picas appearing in length of page? What is the average price of thick leads per pound charged by the maker?

10. Mention some of the various qualities of papers used for general printing with which you may be familiar. At the same time indicate the kinds especially suitable for any particular class of work, and give an idea of the average cost of each.

1909

Executive.

1. Draw up two separate lists: (*a*) printing papers with their different sizes in inches, and (*b*) type bodies with their respective equivalents in points. In each case start with the smallest size.

2. A job is to be printed and delivered in a great hurry, and the paper supplied is of a writing quality. State what ink you would use, and if you had to alter an ordinary stock ink to expedite the work what means you would employ.

3. Enumerate the various spaces and leads used by the compositor, and their proportions to the em or body. Give the names and sizes of both wood and metal furniture and reglet.

4. Describe shortly the difference between the following machines: Wharfedale, platen, two-revolution, and rotary. What is the average speed of the first three kinds mentioned above?

5. Taking the en as a unit, how many ens are contained in a square inch of 12, 8, 14, and 10 point type bodies?

6. What are the advantages of employing process work as compared with the older method of wood-engraving by hand? Which is the better kind of metal, zinc or copper, to use for half-tone work? State the reasons for your opinion and also the cost per square inch usually charged by process firms for both line and half-tone blocks.

7. Explain some of the advantages to be derived from using type bodies cast on the point system as compared with the old standards which generally varied with the different founders.

8. How many sheets are there in a quire of paper, and how many quires form a printer's ream? What is understood by paper being

sent in "imperfect," and also when it is marked either XX or XXX?

9. Specify the advantages of independent driving by electric motors as compared with either steam or gas power which are used for driving machinery in groups.

10. The use of signatures in printing bookwork is admittedly necessary; explain their use and say how you would place them in a work printed in sheets of quarto and of octavo. Which letters of the alphabet are not used by printers for this purpose?

Estimating.

1. A manuscript is given out that is supposed to contain 90,000 words of the English language. It is suggested that it shall make, exclusive of preliminary matter (which ignore), 384 pp. fcap. 8vo size. What type, lead, width and length of page would you propose in order to give a nice looking and readable book? Show how you arrive at your choice.

2. Make out the cost price of composing and printing 2,000 copies of a volume of 352 pp. set in long primer (10 point) solid, crown 8vo size, 53 ens wide and 42 ems long of its own body, including head and white lines, with 10% on cost of long primer added to cover value of small type and other extras. The bill should also include an ordinary antique laid paper of suitable weight for say a novel; show cost of reading and ink. Then add separately what you consider the fair selling price for such a volume, allowing for profit.

3. There are roughly four classes of printing papers in general demand, each with a different surface or finish: (1) antique laid or wove; (2) mill-finish; (3) super-calendered; (4) coated or art. For what classes of work would you employ these four different kinds of paper, and what is the average cost of each sort per pound?

4. In order to create a nicely balanced or well proportioned page of type with good margins, what size or area of type would you recommend for a crown 4to work, $10 \times 7\frac{1}{2}$ inches? What size of type do you consider a suitable one to employ for a volume of that size (crown 4to) if there is no limit given as regards the number of pages it is to make?

5. Supposing a volume is composed in bourgeois (9 point) without leads, and an instruction is given to reset it, still solid, in such a size of type as would exactly double the number of pages, what size would be necessary? Show the working.

6. You have $93\frac{3}{4}$ reams, 516, of quad crown sent in to print a volume of 400 pages of crown 8vo size, with an order to print up to paper. What number of copies should this quantity produce, ignoring the perfectings sent in with the paper, or any question of overs or spoils in printing off?

7. Show how you work out the equivalent weights of demy, double foolscap, imperial, and double crown sizes, to that of 40 lb. royal.

8. What is the relative difference in value between composing 32 pp. of pica (12 point) which cost 48*s.* and the same number of pages set in long primer (10 point) of the same measurement in width and in length?

9. Describe the difference between stereotyping and electrotyping, and state which method is better adapted for frequent reprints of long numbers. What is the cost per square inch for making plates by these two processes, and what form of mount or riser do you recommend to be used in working off a volume at machine from either stereotype or electrotype plates?

10. What weight of type including a percentage allowed for sorts, etc., would you purchase in order to compose a volume of 500 pp. set in solid small pica (11 point), the page measuring $6 \times 3\frac{1}{2}$ inches over all? Give the present-day price for new type in different sizes to be bought in founts of 1000 lb. from the leading founders.

1912

Executive.

1. Describe how you would proceed to cast up any given page so as to find the number of ens contained therein.

2. Give a short list of the various technical marks used in correcting a proof, with a brief explanation of each sign.

3. What is the difference between a perfecting and a two-revolution printing machine? Also state the difference, if any, between a stop-cylinder and a Wharfedale machine.

4. Draw a rough diagram of the ordinary lower case and indicate the lay of the different boxes that you are accustomed to.

5. How many quires or sheets are contained in a printer's ream? What do you understand by imperfect reams; broken paper; retree paper; paper sent in the flat, quired, and lapped?

6. What is a bastard fount of type? State the object of using these types, and how you would take the dimensions in casting-up a page set in such a fount.

7. Platen machines are useful for small jobs up to, say, crown broadside (20×15 in.). Mention some machine you may be familiar with, and say how you would proceed to make ready a plain forme of type, and also at what rate of speed it would be safe to run that machine by power.

8. Chases are supplied both in cast-iron and in wrought-iron. Which do you recommend for general use? What are folding chases and how are they employed?

9. Furniture is made in wood and also in metal. State the advantage of metal as compared with wood, and give the technical name of each size with its measurement in pica ems.

10. Offset printing is an invention of recent years. Write a short description of the method employed for producing work by this process.

Estimating.

1. You have a parcel of copy handed to you to cast off which consists partly of printed matter of various kinds and partly of manuscript subjected to many deletions and insertions. State what steps you would take to arrive at a rough estimate of the number of words contained therein.

2. Assume that the copy described in Question 1 contains 20,000 words and that your instruction is to print it as a 64 pp. demy 8vo pamphlet. What size of type would you suggest to get it into that quantity, leaded or not leaded? Give your local cost price for composing the 64 pp. in the selected fount, with reading separately, and include the cost of machining 2,000 copies on 48 lb. double demy, together with paper, folding and stitching as one section, insetted, edges cut all round (no cover required).

3. What sizes of books are the following: $10 \times 6\frac{1}{4}$ in.; $11 \times 7\frac{1}{2}$ in.; $6\frac{3}{4} \times 4\frac{1}{4}$ in.; $8\frac{3}{4} \times 5\frac{5}{8}$ in.; $7\frac{1}{2} \times 5$ in.; $9\frac{1}{2} \times 6$ in.; 8×5 in.; $8\frac{1}{2} \times 6\frac{3}{4}$ in.; 15×11 in.; $11\frac{1}{4} \times 8\frac{3}{4}$ in.?

4. There are roughly three classes of printing machines in general use, viz.: (*a*) platens, (*b*) single cylinders, and (*c*) rotary machines. State shortly the main differences in manufacture and in working of the three kinds, and say for what class of work each is best adapted.

5. You have a work to give out which includes a large number of textual illustrations, consisting both of line and of wash drawings, besides photographs. What process or processes would you adopt for the reproduction of these various pictures as relief blocks to print with the type?

6. Make out a list in three columns of type bodies (old standard) commencing with Great Primer, adding in the second column the equivalent body in points, and in the third the price usually charged per pound by the leading type founders in founts of 1,000 lb. Bear in mind that prices have advanced in recent years owing to the increased cost of metal.

7. What amount, and in what size, would you order paper to print 15,000 copies of a volume of 416 pp., demy 8vo size? When you have determined the size of sheet, say what weight per ream would form a volume of average thickness for a work of 416 pp. in demy 8vo.

8. If a second edition of a work is likely to be called for and it is not convenient to keep the type standing, what considerations would determine you whether to give the instruction to mould, or to stereotype, or to electrotype the volume?

9. Name the sizes of paper here given in inches: 45×35 in.; 44×30 in.; 50×40 in.; 40×30 in.; 34×27 in. Assume that they are all of the ordinary book-printing quality, and say what price per pound you think would be a fair one to pay if you were giving an order to make, say, a ton.

10. Printers' costs and selling prices have been much discussed in the technical journals of recent date. Assume that you are familiar with the labour cost of producing composition and with the cost of machine printing, and state what percentage to cover all general expenses and profit should be placed on—

(*a*) Composition which includes reading and proofing; and

(*b*) Machine work which should include ink?

GLOSSARIAL INDEX
OF TECHNICAL TERMS AND PHRASES

The following Glossary has been compiled from the author's "Printers' Vocabulary of Technical Terms, Phrases, etc.," 1888, and "Some Notes on Books and Printing," fourth edition, 1912.

ACCENTED LETTERS.—Letters with various marks on used in our own and foreign languages for pronunciation or abbreviation, such as à é î ö ñ ā ĕ etc. 13, 14.

ACCESSORIES.—The tools and other small details necessary for the working of any press or machine. 302.

ACUTE ACCENT.—A mark placed over a letter, thus á. 13.

ALBION PRESS.—An improved iron printing hand-press first invented by Mr. Cope. 194.

—— how to erect. 194.

AMERICAN HARD PACKING.—This refers to the system of making-ready in vogue in America, in contradistinction to the usual style adopted in England. 295.

AMPERSAND.—The abbreviation or sign for the word "and" thus—& (roman), *&* (italic), & (black-letter). 13.

ANTIQUA.—The German expression for roman type. 165.

ANTIQUARIAN.—A size of writing paper, 53 × 31 inches. 334.

ANTIQUE TYPE.—Founts of old or mediaeval character, such as Caslon's. 19, 20, 21.

APPENDIX MATTER, setting of. 91.

ARAB MACHINE.—A small platen machine for jobbing purposes originally made in America. 280.

ARABIC FIGURES.—Ordinary figures, roman or italic, thus —1 2 3 etc., as distinct from roman numerals. 13.

ART PAPER.—Coated papers adapted for half-tone block printing. 330, 337.

ASCENDING LETTERS.—These are all letters with up-strokes, such as b d h k l. 24.

ATLAS.—A size of writing paper, 36 × 26 inches. 331.

ATTITUDE IN COMPOSING, the correct. 75.

AUTHOR'S PROOF.—A proof bearing corrections made by the author or editor. 189.

BACK BOXES.—A term applied to the unoccupied boxes of an upper case where there are no small caps or accents. 87.

BACK-MARK.—The back mark of a laying-on board of a printing machine. 316.

BACK OF A TYPE.—The reverse side to the nick or belly of a type. 23.

BACKS.—Referring to the "back" margin of pages—that part of a book which is sewn when bound; sometimes the crosses are thus termed. 106.

BAD COLOUR.—Too much or too little ink used—also uneven distribution and rolling. 226.

BAD COPY.—Applied to badly written MSS. and "lean" copy. 82.

BAKED.—Applied to type when sticking or caked together, and hard to separate in distributing. 87.

BAND.—A belt or strap for imparting motion from the shaft to a machine. 258.

BANK.—A wooden table or bench for placing the sheets on as printed. 199.

BANK PAPER.—A thin paper mostly used for foreign letter or note paper to save cost of postage. 337.

BAR.—A cylindrical printing machine with "drop-bar" action for laying-on. 316.

BARGE (*see* SPACE BOX).—A small wooden box with six or eight divisions used for holding spaces to alter justification in making corrections. 114.

BASTARD FOUNT.—A fount of type cast on a larger body than originally intended for. This obviates trouble and the expense of leading a smaller body. 24.

BASTARD TITLE.—A fly or half-title before the full title of a work. 91.

BATTER.—Broken or damaged letter or letters through accident, wear and tear, or carelessness. 115.

BEAM ENGINE.—An engine well adapted for driving machines of various classes. 255, 257.

BEARD OF A LETTER.—The blank sloping part, foot or head, of the shoulder of a type not occupied by the face of the letter. 23.

BEARER.—A clump or anything type-high to bear off the impression from the light parts of a broken forme. 221.

BEAT.—In order to impart good colour to a particularly solid part of a forme—a woodcut, for instance—a pressman beats that portion with his roller to give it additional ink. 240.

BED.—The table or "coffin" of a machine or press upon which the forme lies. 191.

BED OF THE FRAME.—The lower part of the frame, which forms a shelf which can be used for placing surplus sorts on. 37.

BELLY OF A TYPE.—The front or nick side of a type. 23.

BELTS.—The straps or bands for driving machinery. 258.

BEVEL OF A TYPE.—The beard or slope from shoulder to face. 23.

BILLS OF TYPE.—Complete founts of type made up to certain weights. 12.

BINDING.—In locking-up a forme if the furniture is longer or wider than the type and doubles, it is said to bind, and the pages cannot be tightened up properly. 111, 113.

BITE.—When a page or portion thereof is not printed by reason of the frisket being badly cut out and the impression only shows. 222.

BRONZE BRUSH.—A special contrivance for dusting bronze by hand. 247.

BRONZE INK. — Various inks made with an addition of bronze. When dry, they give a decided metallic appearance to the surface. 247.

BRONZE PRINTING, how to improve. 248.

BRONZING MACHINE.—A mechanical contrivance to economize time and obviate waste of material. 248.

BROWN PAPERS, sizes of. 339.

BULK. — Usually the bench situated at the end of a composing frame. 64.

BUNDLE.—Generally two reams of paper in a parcel. 330.

BUTTON OF TYMPAN.—The stud on the frame which the hook catches in order to hold the inner and outer tympans secure. 198.

CAKED TYPE.—*See* BAKED.

CALENDERED PAPER. — Paper very highly rolled or glazed, much used for the printing of illustrated works. 295, 330.

CANON.—A type four picas deep in body, but somewhat small in face. 26, 27.

CAPS. — Abbreviation of word "capitals," usually indicated in manuscript by three underlinings. 13, 82, 186.

CAPS AND SMALLS.—A word or words set in small capitals with the initial letter a full capital—thus, PRINTER—indicated by three and two underlinings respectively, thus ═══ and ═══ in manuscript. 82.

CARD CHASES.—Small chases used for cards or similar small jobs. 59.

CARD-CUTTING MACHINE. — A small machine specially made for the cutting of cards. 346.

CARD PRESS.—A small jobbing hand-press—treadle machines are sometimes so called—used for printing cards or other small work. 197.

CARDS, number contained in a royal board. 339.

—— sizes of.—There are several regular sizes, such as large, small, thirds, cabinet, carte de visite, etc. 338.

—— varieties of. 338.

CARRIAGE.—The bed or coffin on which the forme is laid and which runs under the platen or cylinder in a printing press or machine. 191, 289.

CARTE DE VISITE CARDS. — Cards cut $4\frac{1}{8} \times 2\frac{1}{2}$ inches, used by photographers for mounting prints of that size. 338.

CARTRIDGE PAPER. 334.

CASE.—The receptacle in which type is laid to compose from. When in pairs, defined as upper and lower respectively. 42.

CASE-RACKS.—Receptacles for holding cases when out of use —distinct from frame racks, which are used for cases in use. 64, 65.

CASE-WORK, binding. 356.

CASING.—A size of brown paper, 46×36 inches. 339.

CASLON TYPE.—A term sometimes applied to the old-face types cut by William Caslon. 16, 20, 25.

CASTING-UP.—To measure the pages by means of ems and ens of its own type body according to the existing scale of prices. 179.

CAST-IRON CHASES. — Chases made by casting in an iron foundry. These, though cheaper than wrought iron,

two dots over the letter thus, ä ë ï ö ü. 13.

DIAMOND.—A type one size larger than Gem, and one size smaller than Pearl—equal to half a Bourgeois in body. 27.

DISPLAY WORK.—Type displayed, such as titles, headings, and jobbing work, is thus termed to distinguish it from ordinary solid composition. 119.

DISTRIBUTE.—To replace type in cases after printing. 84-87.

DISTRIBUTING DISK.—A circular revolving disk on platen machines for distributing the ink. 276, 277.

DISTRIBUTING ROLLERS.—The rollers which take the ink from the vibrator communicating with the ductor. The rollers have a diagonal movement, and distribute the ink on the table. They are sometimes called "wavers." 289.

DIVISION OF WORDS at end of lines. 186.

DOUBLE.—Words repeated in composition by error, necessitating overrunning; used by pressmen when a sheet is twice pulled or mackled. 114, 229.

DOUBLE BROAD.—Furniture eight picas in width—double the width of "broad." 52.

DOUBLE CASE.—Case specially made, upper and lower case in one, used for small jobbing founts. 42.

DOUBLE CROWN.—A printing paper, 30 × 20 inches. 331.

DOUBLE CYLINDER MACHINE.—A perfecting machine. 271, 314, 315.

DOUBLE DEMY.—A printing paper, 35 × 22½ inches. 331.

DOUBLE ELEPHANT.—A writing paper, 40 × 26¾ inches; drawing, 40 × 26 inches. 334.

DOUBLE FOOLSCAP.—A printing paper, 27 × 17 inches; writing paper, 26½ × 16⅝ inches. 331, 334.

DOUBLE FRAME.—A frame to hold two pairs of cases up at one time. 36.

DOUBLE IMPERIAL.—A printing paper, 44 × 30 inches. 331.

DOUBLE LETTERS.—Diphthongs and old-face letters, æ, œ, ﬅ, ct, etc., are thus called. 13.

DOUBLE MEDIUM.—A printing paper, 38 × 24 inches. 331.

DOUBLE NARROW.—Furniture six picas in width—double the width of a narrow. 52.

DOUBLE PICA.—The name of a fount one size larger than Paragon, and one size smaller than Two-line Pica—it is two Small Picas in depth. 26, 27.

DOUBLE PLATEN MACHINE.—A machine, somewhat out of date, with a flat impression printing at both ends. 271, 284, 285.

DOUBLE POST.—A printing paper, usually 32 × 20 inches. 331.

DOUBLE POTT.—A printing paper, 25 × 15½ inches. 331.

DOUBLE ROYAL.—A printing paper, 40 × 25 inches. 331.

DRESSING A FORME.—*See* CLOTHING.

DROP-BAR perfecting machine.—The laying-on is performed by the "drop-bar" action. 316.

DROPPED HEAD.—Chapter or first pages driven down at the top are thus called. 88.

DRUM, RECIPROCATING.—Attached to the inking apparatus of a machine. 291.

DRYING ROOM.—For printed work, heated by steam or hot water. 350.

DUCT or DUCTOR.—A reservoir which holds the ink in a print-

GREEK CASES.—These are cases of special lay for composing works in that language—the upper case being especially complicated by reason of the many accents required. 152.

GRIPPER OF MACHINE.—The fingers which seize the sheet when fed in to the mark. 290.

GRIPPER perfecting machine. —Applied to those machines which receive the paper by the "gripper" method. 316.

GROOVE OF TYPE.—The hollow between the feet of a letter. 23.

GUILLOTINE CUTTING MACHINE. —A machine made for cutting paper on the "Guillotine" principle. 345.

GUN-METAL SHOOTING STICK. —A locking-up stick tipped with gun-metal to render it more durable. 57.

GUTTER.—The "back" margin or furniture of a sheet. This is the part of a sheet which when folded falls in the back of the book. 106.

HAIR LEADS.—Very thin leads —mostly sixteen to a pica— rarely used nowadays. 48.

HAIR SPACES.—Very thin spaces, used mostly for spacing out the letters in headlines of pages. 13, 28.

HALF-BOUND.—A style of binding having leather backs and corners. 356.

HALF FRAME.—Small composing frames made to hold one pair of cases only. 38, 40.

HALF-SHEET.—Bookwork is sometimes printed in "half-sheet" fashion. When thus printed there are two copies on one sheet. 95.

HALF (or medium) TINTS.—A term applied to the parts of an illustration of partial depth. 237.

HALF-TITLE.—The sub-title in front of the full title. 91.

HALF-TONE BLOCKS.—A process of reproduction as distinct from line blocks. 240.

HAMMER.—The ordinary tool used on press or machine. 202, 302.

HANDMADE PAPER.—Paper made entirely by hand—a slow and tedious process—chiefly used for éditions de luxe. 328.

HANDMADE REAMS.—These generally run 480 sheets to a ream—occasionally 500, or even 516. 330.

HAND ROLLER.—Applied to the press roller used by machine minders in pulling a proof to obviate running up colour with the machine rollers. 204, 294.

HANGER.—An iron bracket attached to the ceiling to hold shafting. 261.

HARD IMPRESSION.—Too much "pull" on the forme, but sometimes necessary for certain classes of work by reason of paper, etc. 220, 296.

HARD PACKING.—An American system of making-ready for printing dry paper. 295.

HARD SIZED PAPERS.—As distinguished from soft or unsized ones. 329.

HEAD.—The top part of a press, or the top part of a page. 88, 194.

HEADINGS, to work, at press. 234.

HEADLINE.—The top line or heading of the page which runs throughout the book. 88.

HEADS.—A term applied to the margin of books at the top of the page. 106.

LEVER composing stick.—The slide-fastener consists of a thumb lever. 45.

LIBERTY PLATEN MACHINE. 280.

LIFT. A handful of printed or unprinted paper is designated a lift. 350.

LIGATURES.—Two or more letters cast in one piece, such as & or ffi. 13, 15.

LIGHT TINTS.—The lighter parts of a cut in printing. 237.

LINES PER THOUSAND, table of number of. 181.

LINES OR WORDS BROKEN.—How to express on proof. 186.

LINOTYPE composing machine. 131-137.

LOCKING-UP APPARATUS.—Applied to the various kinds of patent fastening, such as screws or iron wedges. 54.

LOCK-UP.—To fasten up tightly the quoins of a forme by means of a mallet and shooting-stick. 53, 113.

LOCK-UP CHASES.—Special chases made in order to dispense with large quantities of furniture in filling up spare room in formes or on the press. 60.

LONDON SCALE for type composition, abstract of. 178.

LONG CROSS.—The longest cross-bar of a chase. 58, 106.

LONG LETTERS.—Accented letters used to denote contractions or pronunciation, as ā ē ī ō ū, etc. 14; *see also* 24.

LONG PRIMER.—A type one size larger than Bourgeois and one size smaller than Small Pica, equal to two Pearls. 26, 27.

LOW.—When letters or other parts of a printed sheet do not show up clearly they are said to be "low." 221.

LOW TO PAPER.—*See* HEIGHT TO PAPER.

LOWER CASE.—The case which contains the small letters, points, and spaces—the lower of a pair of cases. 40, 42.

LUBRICATING.—The act of oiling any part of a press or machine. 227, 302.

LUBRICATORS.—Small glass globes placed on the shafting to lubricate the working parts of a machine. 260.

LUG.—When rollers are tacky or stick together they are said to lug. 301.

LYE.—The preparation used for cleansing type after printing. 87, 229.

LYE JARS. 228.

LYE TROUGH.—The receptacle for holding lye. 228.

MACHINE MINDER.—The skilled workman who is responsible for the care of a machine. 302.

MACHINE PAPER.—Paper other than that made by hand. 328.

MACHINE POINTS.—Special points which are used in the machine department, and distinct from press points. 301.

MACHINE PRINTING. 270-274.

MACHINES, care of. 272.

—— classification of. 271.

—— laying down. 271, 302.

MACKLE.—A printed sheet with a slurred appearance, owing to the frisket dragging, or a defect in the impression. 229.

MAHOGANY composing stick.—Principally used for newswork. 44, 46.

MAKE EVEN.—In copy with long paragraphs, compositors have sometimes to finish their portions at the end of a line, in order to expedite the closing

machine for newspaper work invented by Messrs. Pardoe and Davis. 327.

PASTE-POINTS.—Very fine points—usually drawing-pins—used for very closely registered work on press. 223, 246.

PATCH UP.—To overlay or bring up an impression sheet with pieces of thin paper. 221.

PEARL.—A type one size larger than Diamond and one size smaller than Ruby, equalling half a Long Primer in depth—the smallest type enumerated by Moxon. 26, 27.

PEARLASH.—Carbonate of potash when diluted is used as a wash for type. 229.

PECULIARS.—A general term for out-of-the-way sorts, *i.e.*, accents, records, etc. 13, 86.

PEDESTAL INK TABLE.—A small ink table on a single leg or pedestal. 202.

PEEL.—A wooden implement used for hanging up printed sheets for drying. 351.

PEELING.—A process of preparing overlays by skivering or thinning down the hard edges of an illustration. 238.

PERCELER TWO-FEEDER MACHINE.—Designed and made by Messrs. Dawson. 310, 312.

PERFECT PAPER.—Reams of paper made up to a printer's ream, *i.e.*, 516 sheets, are said to be "perfect." 330.

PERFECT UP.—This is the printing of the second side of the paper in half-sheet or sheet work. 222.

PERFECTING MACHINE.—A double cylindrical machine which prints both sides of the sheet at one operation. 269, 314, 315.

PERFORATING. 357.

PHŒNIX PLATEN MACHINE. 280.

PICA.—A type one size larger than Small Pica and one size smaller than English—the body usually taken as a standard for leads, width of measures, etc.—it is equal to two Nonpareils in body. 26, 27.

PICA-GAUGE.—A type scale or measure made to pica ems. 110.

PICK.—A speck or blur caused by dirt or badly distributed ink on the face of a letter. 235.

PIE.—Type broken or indiscriminately mixed. 85.

PINCHED POST.—A writing paper, small post, $18\frac{1}{2} \times 14\frac{3}{4}$ inches. 335.

PIN-MARK.—The slight mark in the side of a type near the top of the shank made in casting by machinery. 5, 23.

PIT.—The hollow cavity in the floor under a machine for accessibility to the under parts. It is sometimes also necessary for the steady working of a machine. 272.

PITCH.—Placing the forme on a machine to a given position, in order that the type may be printed in a correct position on the sheet. 291.

PITCH, FINDING THE.—An expression used in obtaining the precise lay on a machine. 291.

PLAIN TYPES.—As distinct from fancy or jobbing founts—generally book-founts. 119.

PLANER.—A flat smooth piece of wood used for levelling the type before locking-up. 57, 113.

PLATE PRINTING.—Intaglio printing—the reverse of relief. 1.

PLATEN JOBBING MACHINES.—Worked by either steam or foot. 271, 280-282.

PLATEN MACHINE.—A printing

CHISWICK PRESS: CHARLES WHITTINGHAM AND CO.
TOOKS COURT, CHANCERY LANE, LONDON.

SAMPLES OF PAPER.

Compare the various Tables for Sizes and Equivalent Weights in Chapter XXXI.

THESE sixteen Samples of various qualities of paper have been taken at random from the stock of a well-known firm of London stationers, and the prices given here are those quoted to the Trade. The Student is advised to read carefully Chapter XXXI. and to study the different classes of paper shown here for character, quality, finish, and substance. A comparison of any one paper with the tables in the chapter mentioned will give the equivalent in weight of other sizes, and the difference between perfect and imperfect reams.

Sample.	*Class of Paper.*	*Description.*		*Weight.*	*Sheets to Ream.*	*Price per lb.*	*Remarks.*
		Name.	*Size.*			*d.*	
A	Creamy Ordinary Printing.	Qd. Cr.	30×40	88	516	2½	Also obtainable in white, or in toned shade.
B	Antique Laid Printing ..	Qd. Cr.	30×40	90	516	2¾	Also made with and without deckled edges.
C	Antique Wove Printing Light Bulking	Qd. Cr.	30×40	90	516	2⅝	Also made with and without deckled edges.
D	Imitation Art	Qd Cr.	30×40	100	516	2⅞	An imitation of coated "Art" paper.
E	Double Super-calendered Paper, soft sized	Qd. Cr.	30×40	120	516	2⅞	Suitable for works with half-tone cuts.
F	Mould-made Laid	Dbl. Cr.	20×30	50	516	7	Made by a new process & has a deckle all round.
G	Art (Coated) Paper	Dbl. Cr.	20×30	55	480	3¾	For best effects in half-tone work.
H	Sup. Fine Plate Paper ..	Crown	15×20	40	516	6	For wood-cut or copper-plate work.
I	Handmade Cream Laid ..	Dbl. Cr.	20×30	56	516	12	For *éditions de luxe*; deckled edges, four sides.
J	Cream Laid Writing	Lg. Post	16½×21	21	480	3⅛	A cheap writing paper.
K	Cream Wove Writing ..	Lg. Post	16½×21	21	480	3⅛	A cheap writing paper.
L	Vellum Laid Writing ..	Lg. Post	16½×21	28	480	8	A better-class writing.
M	Vellum Wove Writing ..	Lg. Post	16½×21	30	480	8	A better-class writing.
N	Imitation India	Dbl. Cr.	20×30	12	516	8½	Used for Bibles and thin paper editions.
O	Yellow Wove	Lg. Post	16½×21	21	480	2¾	Light tint of "blue wove"—a technical anomaly.
P	Green Tinted Printing ..	Dbl. Cr.	20×30	40	480	2⅝	To be had in various tints suitable for job-work.

N.B.—All these papers are cut from the sizes and weights indicated in the above columns, and papers quoted as being in the quad size may be divided to arrive at the half size; e.g., the size of Double Crown is 30 × 20 *in., as against Quad Crown,* 40 × 30 *in.*